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5	1327	((493/187,213,214,927) or (53/412,133.4,139.2)).CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/07 03:51
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12	2	("5956924").PN.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2003/04/07 04:49



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United States Patent [19][11] **Patent Number:** **5,956,924****Thieman**[45] **Date of Patent:** **Sep. 28, 1999**

[54] **METHOD AND APPARATUS FOR PLACING
A PRODUCT IN A FLEXIBLE
RECLOSEABLE CONTAINER**

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[51] Int. Cl.⁶ **B65B 61/18**

[52] U.S. Cl. **53/412; 53/450; 53/133.4;
53/139.2**

[58] **Field of Search** 53/412, 410, 450,
53/451, 133.4, 139.2, 550, 551, 552; 493/213,
214, 215, 927

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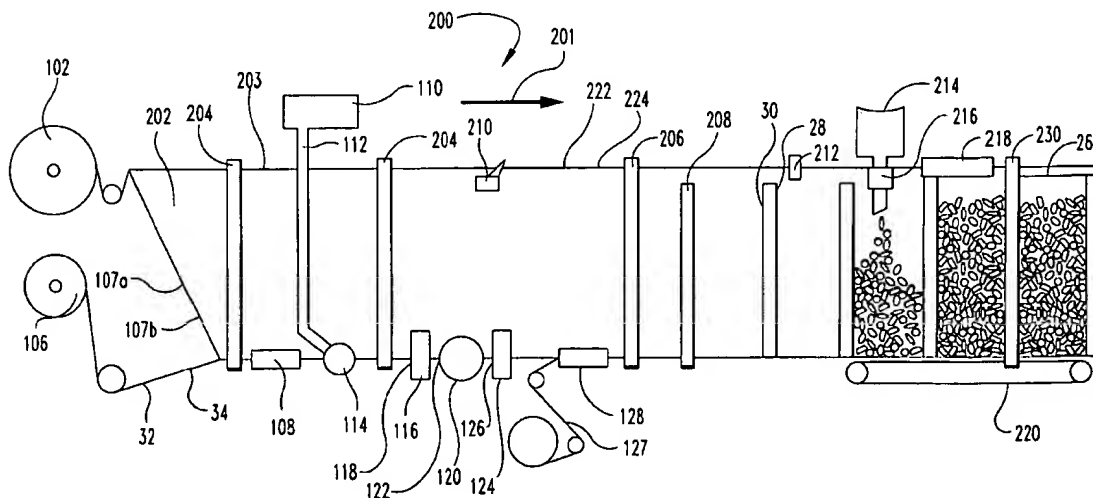
Primary Examiner—Linda Johnson

Attorney, Agent, or Firm—Woodard, Emhardt, Naughton
Moriarty & McNett

[57] **ABSTRACT**

An invention for forming, filling, and sealing a flexible recloseable container. Both vertical and horizontal methods for placing product within the container are disclosed. The invention includes guiding a web of film which has interlocking fastener strips sealed to the web. A slider for locking and unlocking the fastener strips is placed in the correct orientation, spread apart at a pair of inner feet, and inserted over the fastener strips. The slider is positioned to close a substantial portion of the strips, and then an end stop, docking station, and corner seal are formed against a sealing plate. The slider is then repositioned, and a tamper evident seal may be placed over the fastener strips.

31 Claims, 6 Drawing Sheets



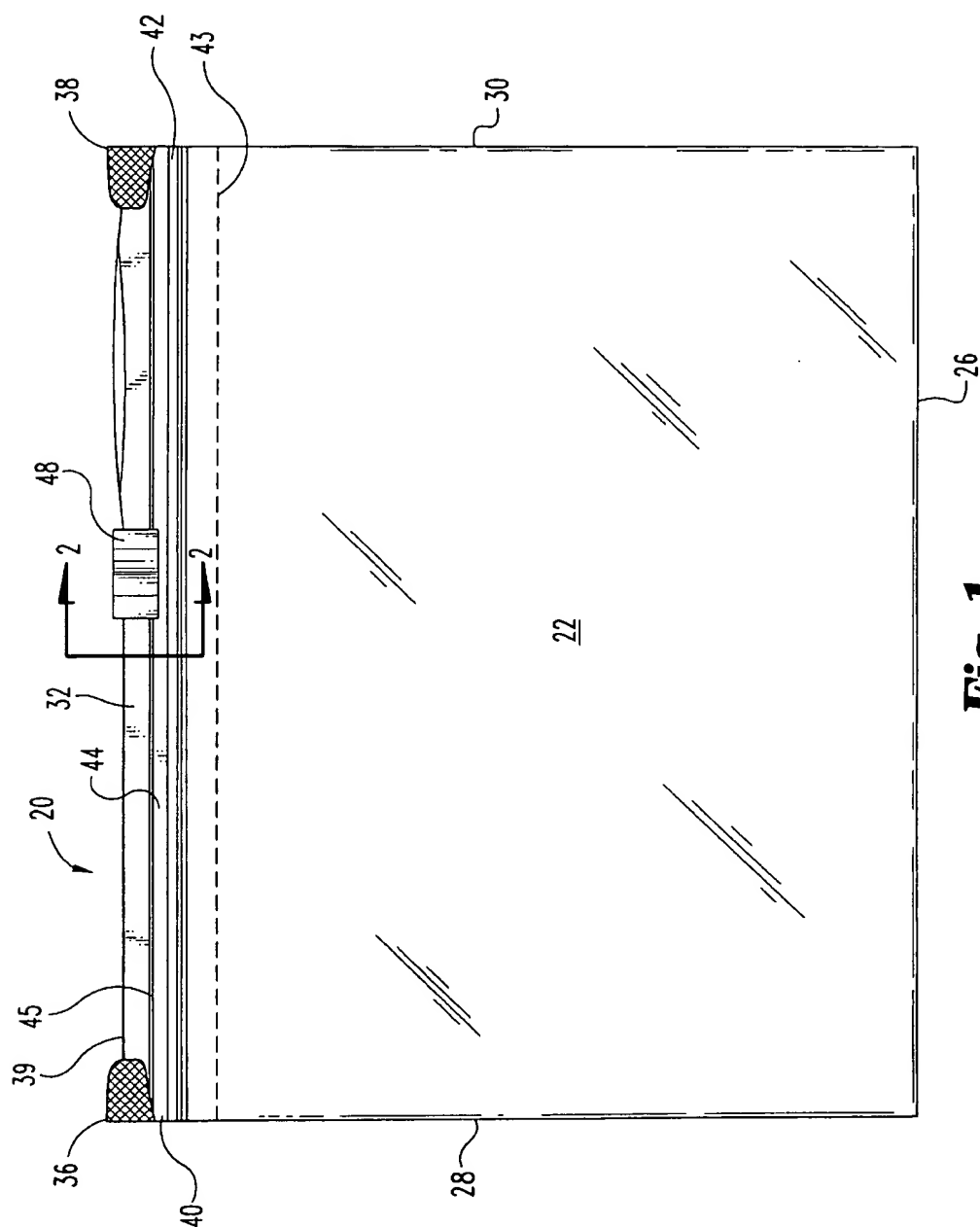


Fig. 1

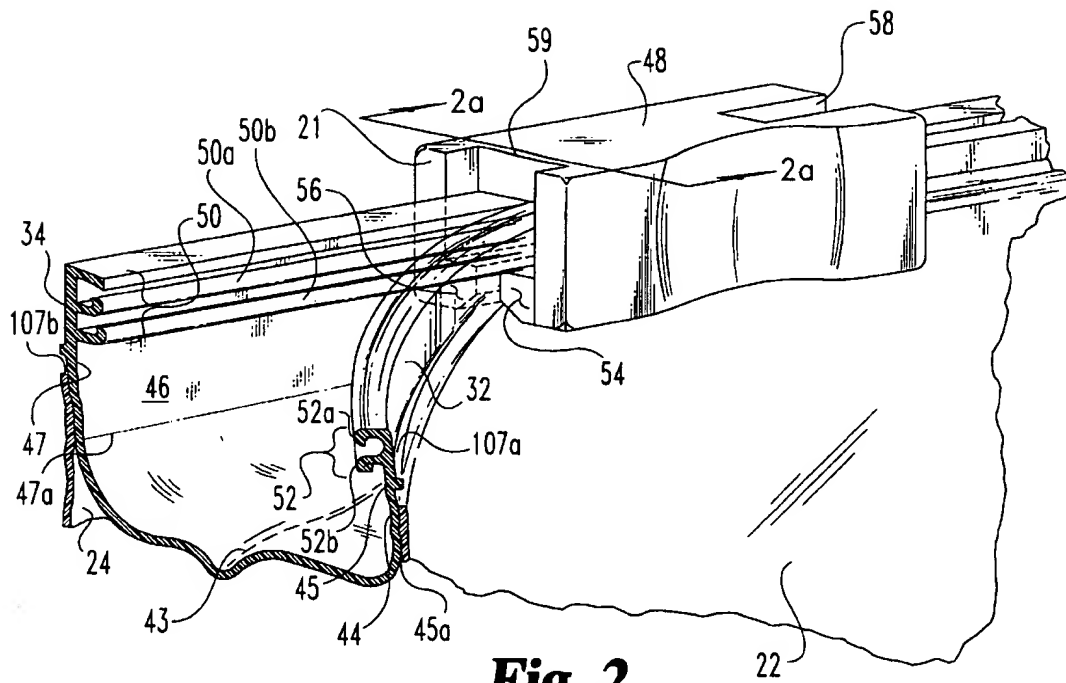


Fig. 2

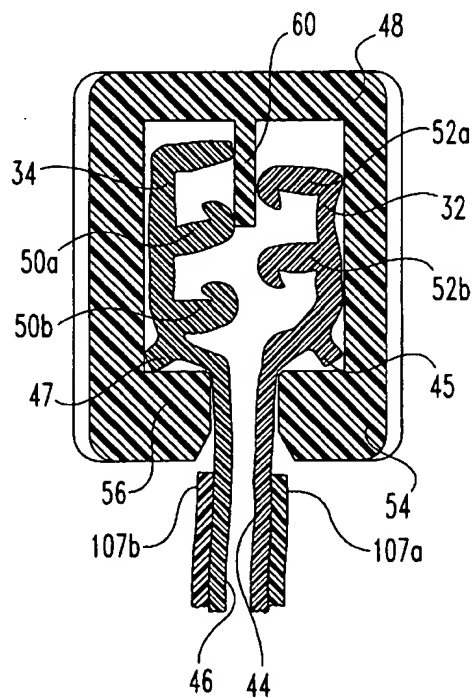
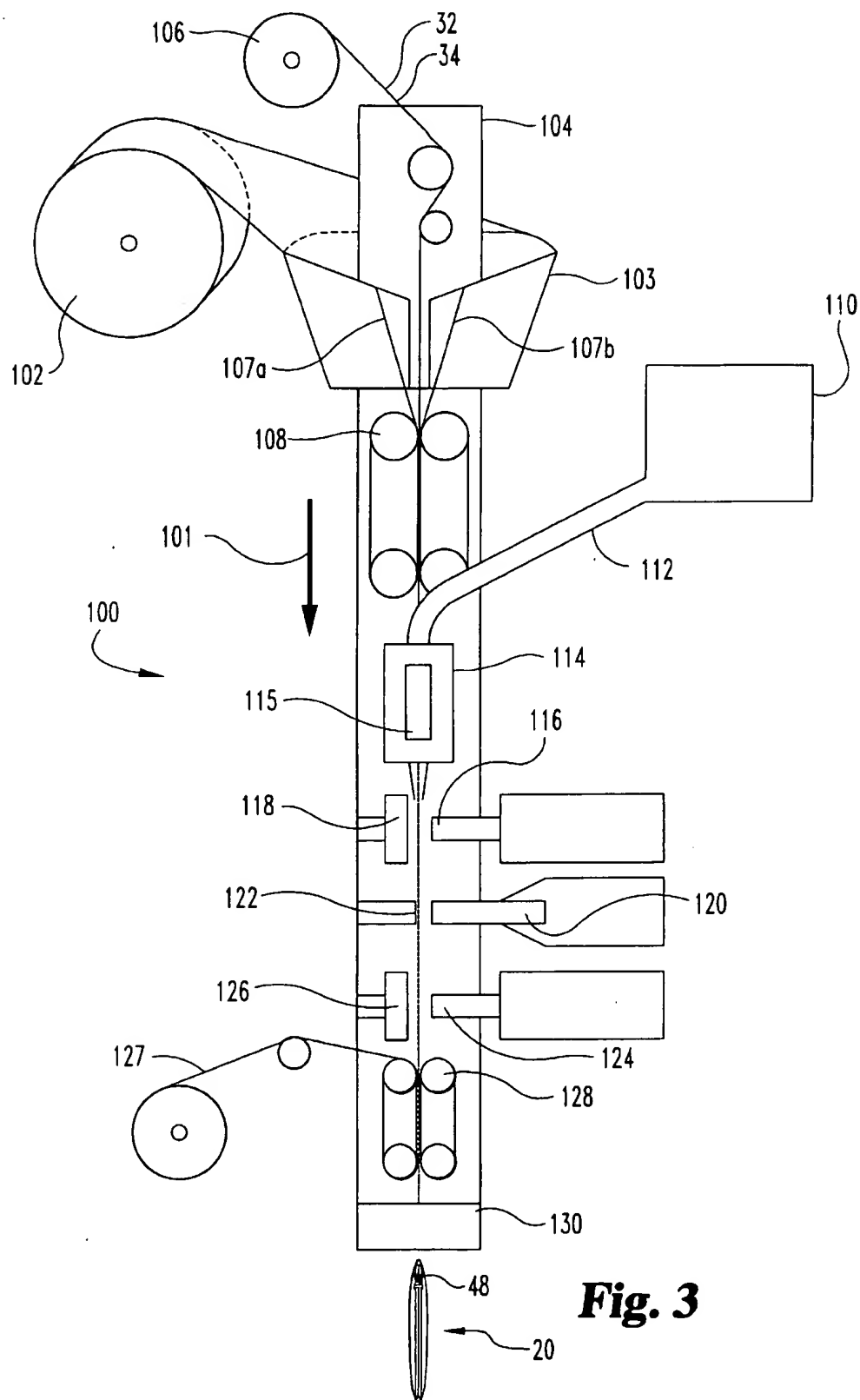
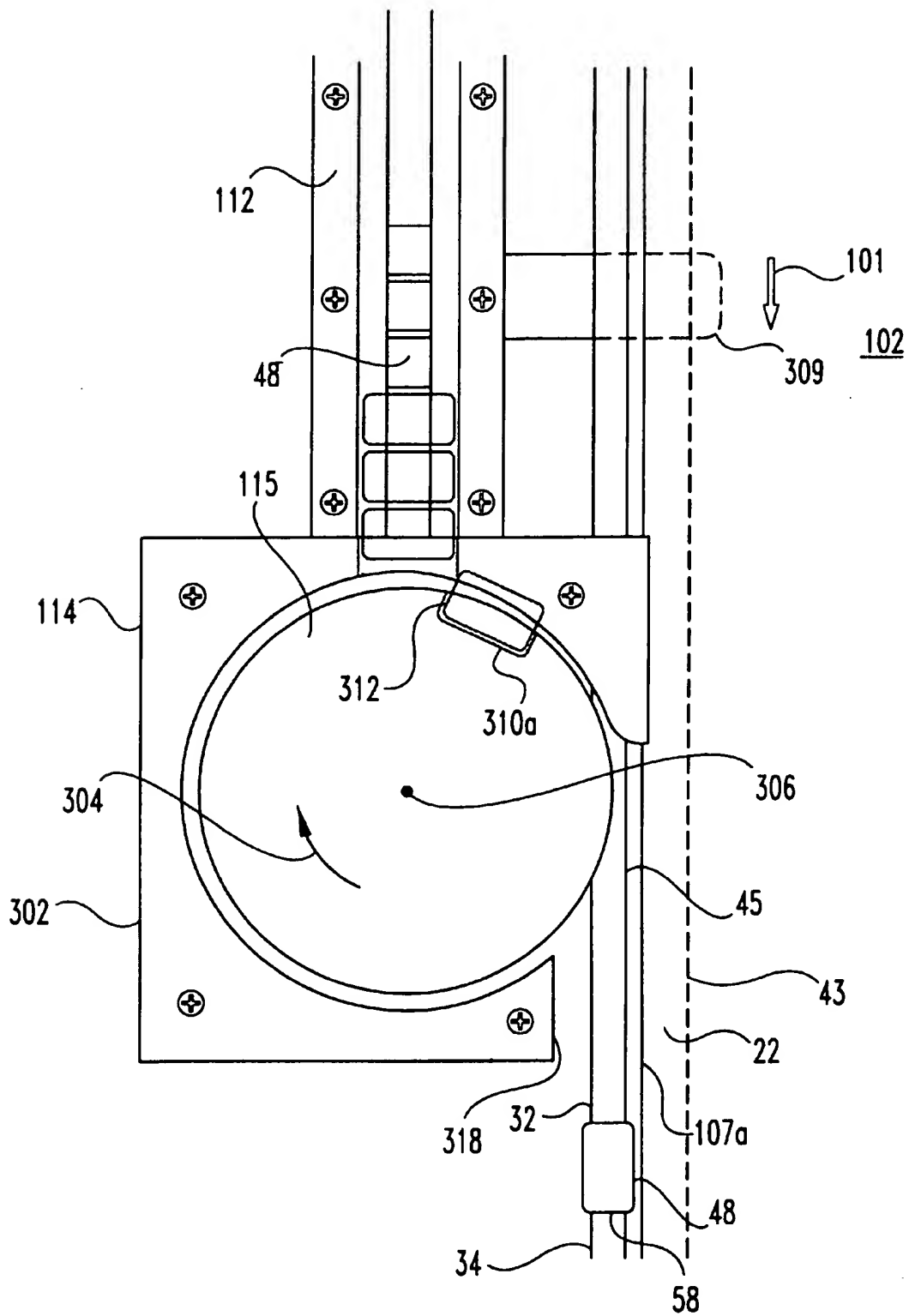
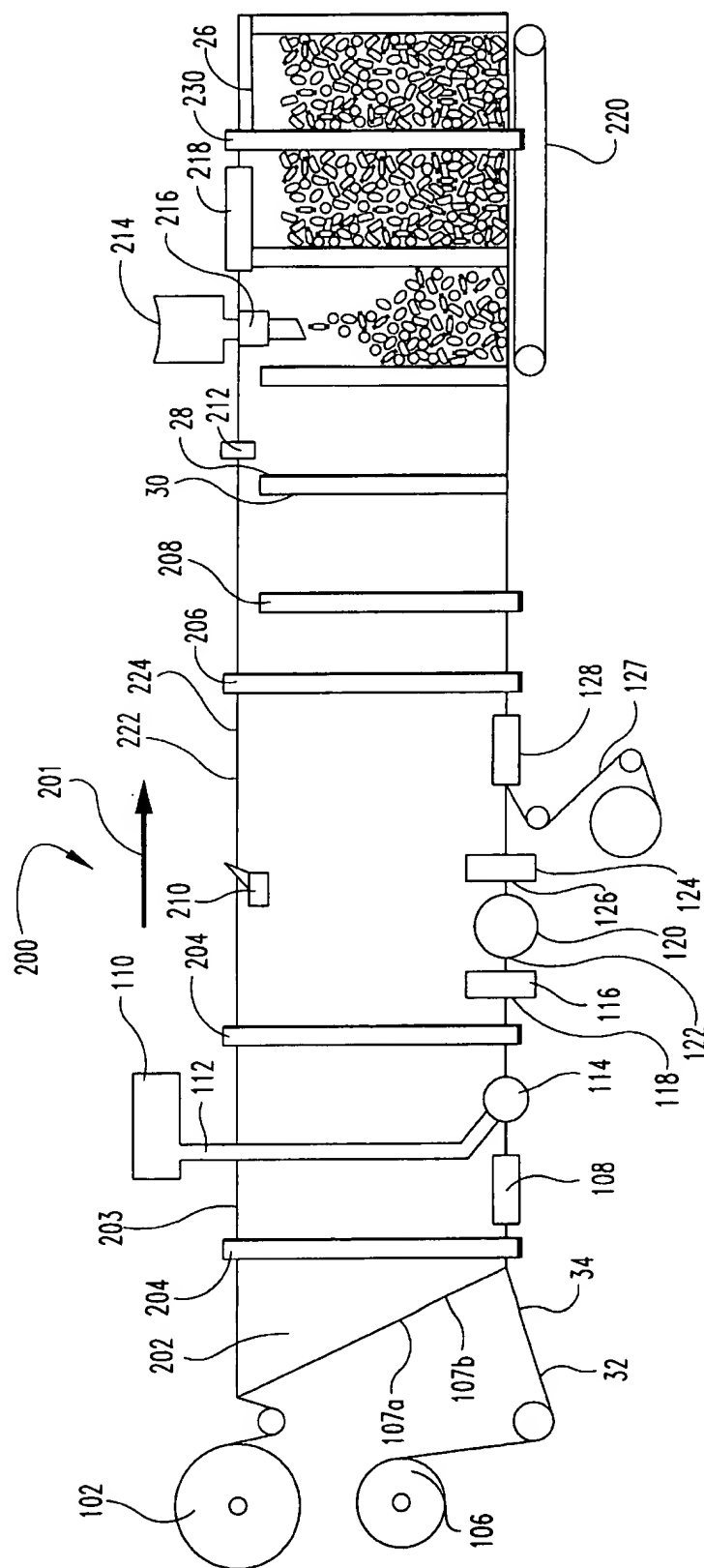


Fig. 2a

**Fig. 3**

**Fig. 4**

**Fig. 5**

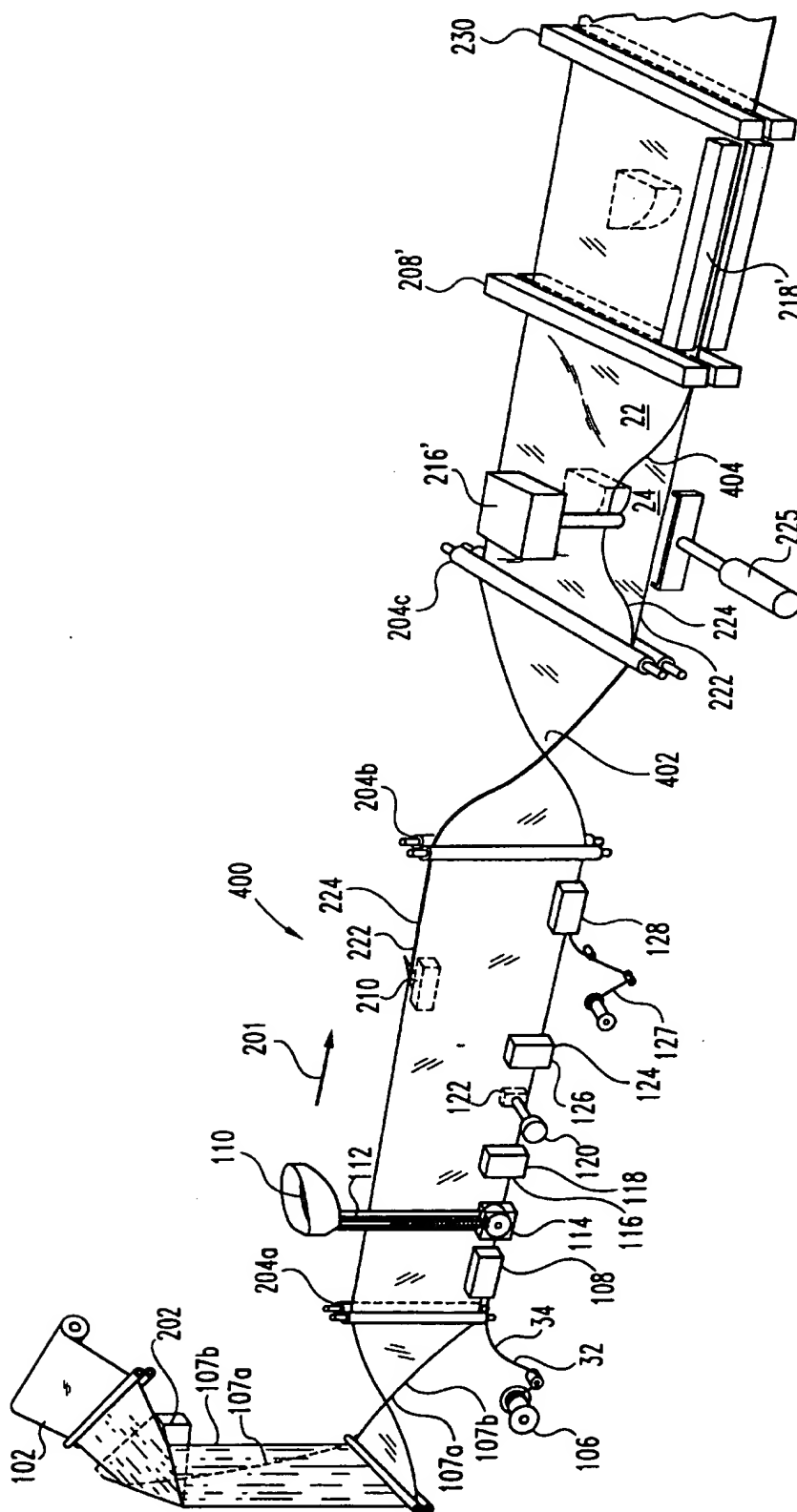


Fig. 6

METHOD AND APPARATUS FOR PLACING A PRODUCT IN A FLEXIBLE RECLOSEABLE CONTAINER

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for placing a product in a flexible, recloseable container. However, certain applications may be outside of this field.

Flexible, recloseable containers such as zipper-type plastic bags are a significant advancement in the field of pre-packaged items both for industrial and retail uses. The packaging industry recognizes the importance of using interlocking fastener profile strips to provide the ability to reclose the container after first use. It is also important that it be easy for the user to reliably close the interlocking strips. For instance, some containers utilize multi-colored interlocking strips to make it easier for the consumer to determine if a container is closed. Another way in which to provide for reliable interlocking is by the use of a slider that opens the interlocks when moved in one direction, and closes the interlocks when moved in the other direction. Sliders have not been applied to flexible, recloseable containers being filled with a product on a form, fill, and seal machine. What is needed is a method for incorporating a slider on a flexible, recloseable container that is formed, automatically filled with a product, and sealed. The present invention provides this in a novel and unobvious way.

SUMMARY OF THE INVENTION

One aspect of the present invention provides a method for placing the product in a flexible recloseable container. The method includes feeding a web of flexible film with interlockable fastener strips. A slider is oriented to a predetermined orientation, and placed over the fastener strips. The slider is moved relative to the fastener strips such that the fastener strips are generally closed. A transverse seal is generally formed across the film and a product is placed within the web.

Another aspect of the present invention provides an apparatus for placing a product in a flexible recloseable container. The apparatus includes means for feeding a web of flexible film with interlockable fastener strips, the strips including shoulders. There is also a slider for locking and unlocking the fastener strips, the slider having feet. The apparatus also includes a slider application machine for placing the slider on the fastener strips. The slider application machine includes a rotatable selector wheel and a spreading ridge. The wheel includes a pocket for accepting the slider and moving the slider while it is in contact with the spreading ridge, such that the feet are spread apart sufficiently to pass freely over the shoulders of the fastener strips. There is also a sealing mechanism for forming at least a partial transverse seal generally across the film. The apparatus also includes means for placing a product within the web of flexible film.

It is an object of the present invention to provide an improved method for placing a product in a flexible recloseable container.

This and other objects of the present invention will be found in the claims, description, and drawings of the embodiments of the present invention to follow.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a flexible recloseable container for containing a product, the container being suitable for being formed, filled, and sealed in several embodiments of the present invention.

FIG. 2 is an enlarged perspective fragmentary cross sectional view of the container of FIG. 1 as taken along line 2—2 of FIG. 1, with one sidewall partially peeled away from the other sidewall.

FIG. 2a is a partial cross-sectional view of the container of FIG. 2 as taken along line 2a—2a of FIG. 2.

FIG. 3 is a schematic representation of apparatus 100, one embodiment of the present invention, for forming, filling, and sealing a container in a substantially vertical manner.

FIG. 4 shows a side elevational view of a slider application machine useful with the present invention.

FIG. 5 is a schematic representation of a side view of apparatus 200, another embodiment of the present invention, for forming, filling, and sealing a container in a substantially horizontal manner.

FIG. 6 is a perspective schematic of apparatus 400, another embodiment of the present invention, for forming, filling, and sealing a container in a substantially horizontal manner.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

FIG. 1 shows a flexible recloseable container 20 for containing a product, container 20 useful for being formed, filled, and sealed in several embodiments of the present invention. Container 20 comprises first and second sidewalls 22 and 24, respectively, which may be made from any suitable thermoplastic film such as, for example, low density polyethylene, linear low density polyethylene, or similar materials. Sidewalls 22 and 24 include first left transverse side seal 28 and second right transverse side seal 30. Container 20 also includes a bottom edge 26 generally opposite a pair of interlocking fastener strips 32 and 34. Bottom edge 26 may include a fold between sidewalls 22 and 24, such as for a container formed using some embodiments of a vertical form, fill and seal apparatus, or alternatively edge 26 may include a seal between sidewalls 22 and 24, such as for a container 20 formed using other embodiments of a horizontal form, fill, and seal apparatus.

FIG. 2 is an enlarged cross section of the container of FIG. 1 as taken along line 2—2 of FIG. 1 with sidewall 22 partially peeled away from sidewall 24. As shown in both FIGS. 1 and 2, interlocking strips 32 and 34 of fastener profiles run along the top edge of container 20. Strips 32 and 34 are sealed together at endstops 36 and 38. A docking station 39 is located near endstop 36. Strips 32 and 34 are sealed to each other and also to sidewalls 22 and 24 at corner seals 40 and 42. Corner seals 40 and 42 are located along their respective edges of container 20. Seals 40 and 42 are generally located below shoulders 45 and 47 of fastener strips 32 and 34, respectively, and above lower edges 45a and 47a of inner flanges 44 and 46 of fastener strips 32 and 34, respectively. In one embodiment of the present invention, container 20 includes a tamper-evident seal 43 between sidewalls 22 and 24. Seal 43 may be an extension of flanges 46 and 44 that extends internally across the

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opening of container 20. Seal 43 may be integrally molded with flanges 44 and 46, or may be attached separately. The broken or unbroken state of seal 43 provides evidence to the user of whether or not container 20 has been previously opened. A tamper evident seal is especially useful with a form, fill, and seal machine that inserts an edible product into container 20.

Slider 48 is slidable upon fastener strips 32 and 34. Movement of slider 48 along the fastener profiles results in either an interlocking of profiles 50 and 52, or an unlocking of profiles 50 and 52. In some embodiments of the present invention profiles 50 and 52 are comprised of uppermost and bottommost closure elements. In one embodiment there is an uppermost closure element 50a that interlocks with uppermost closure element 52a, and a bottommost closure element 50b that interlocks with bottommost closure element 52b. In a more preferable embodiment of the present invention separator 60 has a length sufficient to separate elements 50a and 52a, and its length is otherwise kept to a minimum. In this manner, separator 60 is kept from interfering with spreading ridge 314 of slider application machine 114, as will be shown later. It is preferable that slider 48 be cast or molded as a single piece, such that subsequent spreading of slider 48 by slider application machine 114 does not unduly stress a joint between separate slider components.

FIG. 2a is a partial cross-sectional view of the container of FIG. 2 as taken along line 2a—2a of FIG. 2. Slider 48 is shown enclosing non-interlocked portions of fastener strips 34 and 32. A separator 60 separates closure elements 50a and 52a. Feet 54 and 56 of slider 48 retain slider 48 on the interlocking strips by shoulders 45 and 47, respectively.

FIG. 3 is a schematic representation of apparatus 100, one embodiment of the present invention. Apparatus 100 is useful for forming, filling, and sealing a flexible recloseable container such as, for example, container 20 in a generally vertical orientation. Apparatus 100 includes rollers, belts, or similar devices for feeding film web 102 to a film guide 103 that accepts the sheet of web 102 and forms it into a generally tubular shape over the outside of filling tube 104, with web 102 proceeding in a direction as indicated by arrow 101. The supply 102 of film web is in a sheet form, as depicted.

Interlocking strips 32 and 34 of fastener profile are provided from a supply 106. Alternatively, some embodiments of the present invention include interlocking strips 32 and 34 which have previously been made integral with web 102. Strips 32 and 34 are substantially interlocked as provided, and pass over one or more guiding and tensioning rollers, and then between free edges 107a and 107b of web 102. Sealing mechanism 108 forms a continuous seal along edge 107a of web 102 and fastener strip 32, including a portion of inner flange 44. Sealing mechanism 108 is preferably of a type that utilizes either heated metal bars or electrical impulse sealing bars. It is preferable that edge 107a seal against and overlap flange 44 and not shoulder 45. Likewise, free edge 107b is sealed along inner flange 46 of fastener strip 34, and preferably does not overlap shoulder 47, although there may be overlapping of the free edge and the shoulder in some embodiments of the present invention. In a more preferable embodiment of the present invention, strips 32 and 34 are oriented relative to edges 107a and 107b, respectively, such that free edges 107a and 107b are not between feet 54 and 56, respectively, so as to facilitate placement of slider 48 on strips 32 and 34 by slider application machine 114.

A vibrating hopper 110 provides sliders 48 to channel 112 in an orientation appropriate for insertion of slider 48 onto

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fastener strips 32 and 34. Slider 48 is preferably oriented on fastener strips 32 and 34 such that the more narrow, interlocking end 58 of slider 48 faces in direction of the movement 101 of film web 102. The wider, unlocking end 59 of slider 48 is thus oriented opposite to direction of motion 101. Channel 112 provides sliders 34 to slider application machine 114. The present invention also contemplates those embodiments in which unlocking end 59 is oriented to face in the direction of movement 101.

Slider application machine 114 includes a motor-driven rotating selector wheel 115 which rotates within a semi-circular pocket of mounting block 302. Selector 115 rotates in a direction indicated by arrow 304 about axis of rotation 306. Sidewalls 22 and 24 of web 102, with fastener strips 32 and 34 attached, move in direction 101. A stationary probe 309 spreads apart fastener strips 32 and 34 as the strips move toward slider application machine 114. Probe 309 is shown extending from channel 112 and preferably passing between both sets of closure elements 50a and 52a, and 50b and 52b. However, it is also acceptable in some embodiments of the present invention that probe 309 extend only between top closure elements 50a and 52a. In this manner the bottom closure elements remain interlocked, and slider 48 need not be spread apart as much to pass over the bottom closure elements 50b and 52b. This partial opening by probe 309 would be useful in those embodiments of the present invention that utilize sliders 48 that cannot be spread apart far enough to extend over the bottom closure elements.

FIG. 4 shows a side elevational view of a slider application machine useful with the present invention. Selector 115 includes within it four pockets 310. A first pocket 310a is shown after having accepted a slider 48 out of channel 112. As selector 115 rotates, pocket trailing edge 312 pushes slider 48 past a spreading ridge within block 302. The ridge contacts feet 54 and 56 of slider 48. The spreading ridge has a cross-sectional width that increases in the direction of rotation of selector 115. The height of the spreading ridge must be compatible with the length of separator 60 of slider 48, such that the two do not interfere during the spreading operation. As slider 48 is pushed along the spreading ridge, feet 54 and 56 are spread apart a sufficient distance to pass over closure elements 50 and 52 and shoulders 45 and 47. The present invention also contemplates those embodiments in which feet 54 and 56 also pass over edges 107a and 107b, respectively.

Web 102 traverses along filling tube 104, with strips 32 and 34 passing through a guiding slot within mounting block 302. The guide ensures proper orientation of the fastener strips 32 and 34 prior to placement of slider 48 on the strips. It is preferable that web 102 momentarily stop as selector 115 is rotated about 90 degrees. The positional movements of selector 115 and web 102 are synchronized such that a single slider 48 is placed on each container 20. In one embodiment of the present invention this synchronization is achieved by controlling both the rotational actuation of selector 115 and the flow of web 102. This control may be achieved by an analog controller that senses the stoppage of web 102, such as, by way of example only, a positional sensor on a gear train driving rotating scaling mechanism 108, or by an optical sensor that stops web 102 when a particular visual feature of web 102 passes in front of the sensor. As another example, synchronization may be achieved by a digital electronic controller that actuates selector 115 after determining from an encoder that a portion of web 102 equivalent to the width of container 20 as gone past machine 114 since the last slider 48 was placed over strips 32 and 34.

A pocket 310 with a slider 48 located therein is rotated to position slider 48 on web 102. Slider 48 moves over the spreading ridge and is spread open. Selector 115 then places slider 48 over fastener strips 32 and 34 at a first location before feet 54 and 56 have had sufficient time to return to their normal unspread configuration. Slider 48 returns to its unspread configuration under the influence of elastic forces within slider 48. Selector 115 stops rotation at a position with the pocket leading edge pulled away from contact with interlocking end 58 of slider 48. Web 102 is free to continue moving along filling tube 104 without interference from pocket 310. Edge 318 of mounting block 302 is cut back a sufficient amount to permit slider 48 to freely pass thereby. By momentarily stopping web 102 as selector 115 is rotated, and also by moving the pocket leading edge away from contact with slider 48, it becomes unnecessary to coordinate the rotational speed of selector 115 with the linear speed of web 102. Web 102 is preferably static when slider 48 is applied. The present invention also contemplates those embodiments in which either or both selector 115 and web 102 move in a generally continuous fashion.

After placing a slider 48 over fastener strips 32 and 34 at the first location, slider 48 is then held in a static position by positioning arm 116 and slider receiver 118 as film web 102 continues to be pulled down filling tube 104. Arm 116 may be a pocket or hand located at the end of a pneumatic cylinder, the pocket or hand having a shape complementary to a portion of slider 48. Actuation of the cylinder places the pocket or hand near slider 48 and constrains slider 48 to a position. Receiver 118 may be a pocketed plate or a flat plate that helps constrain motion of slider 48 when arm 116 is actuated.

Arm 116 and receiver 118 thus position slider 48 such that it does not interfere with the formation of corner seals 40 and 42. Because of the orientation of interlocking end 58 to face in the direction of the flow of web 102, holding slider 48 stationary as web 102 continues to move ensures that interlocking strips 32 and 34 are interlocked downstream of each slider 48. For those embodiments of the present invention in which unlocking end 59 faces in the direction of the flow of web 102, the present invention contemplates moving slider 48 relative to web 102 such that strips 32 and 34 are interlocked downstream of each slider 48.

A portion of this interlocked length of strips 32 and 34 is presented between sealing horn 120 and sealing plate 122. A pneumatic cylinder places horn 120 at a second location along fastener strips 32 and 34 and free ends 107a and 107b, and against sealing plate 122. By means of heat, ultrasonic energy, or similar process horn 120 fuses the portions of fastener strips and sidewall between horn 120 and sealing plate 122 and simultaneously forms a corner seal 40 and endstop 36 of a first container 20, and a corner seal 42 and endstop 38 of an adjacent, second container 20. It is preferable that horn 120 and sealing plate 122 not alter shoulders 45 and 47, such that there remains shoulders 45 and 47 generally across the width of container 20 to restrain slider 48.

As the assembly of web 102, fastener strips 32 and 34, and slider 48 move down along filling tube 104, there is a second repositioning of slider 48. Slider 48 is positioned adjacent the second location fused by horn 120 and sealing plate 122 by positioning arm 124 which holds slider 48 stationary against slider receiver 126, in a manner similar to the positioning by arm 116 and receiver 118. It is preferable, but not necessary, that slider 48 be moved in a manner which interlocks strips 32 and 34 and positioned adjacent endstop 36 before endstop 36 is fully hardened. The softened area of

strips 32 and 34 adjacent endstop 36 is thereby permanently deformed by slider 48. This movement of slider 48 into the previously fused area has been observed to reduce leakage from container 20. This permanently deformed area is docking station 39.

In some embodiments of the present invention, a tamper evident seal 127 is provided over guiding and tensioning rollers and into a second sealing mechanism 128. Mechanism 128 fuses a tamper evidence exterior seal 127 near free ends 107a and 107b of web 102, and over the exterior of slider 48 and fastener strips 32 and 34. In other embodiments of the present invention, a tamper evident interior seal 43 is located inside and between fastener strips 32 and 34, as indicated by dotted line 43 of FIG. 1. In other embodiments of the present invention it is not necessary to have a tamper evident seal.

As web 102 flows off of filling tube 104, a cutting and sealing mechanism 130 places a seal transversely across sidewalls 22 and 24. Having thus formed the first transverse seal of container 20, a product may be placed into the vertically extending filling tube 104 to thus fall within container 20. When container 20 is full and flows off of tube 104, sealing and cutting mechanism 130 forms the other transverse seal of container 20, and severs container 20 from web 102. The sealing and cutting mechanism 130 simultaneously forms the lower seal of the next container 20.

FIG. 5 is a schematic representation of a side view of another embodiment of the present invention, apparatus 200 for forming, filling, and sealing a container such as container 20 in a substantially horizontal manner. The use of similar element numbers denotes elements substantially related to those already described.

A web 102 of film is fed over rollers and along a folding guide 202 in a horizontal direction as indicated by arrow 201. Guide 202 folds web 102 in half, with fold 203 preferably located above free edges 107a and 107b. It is also acceptable that fold 203 be located laterally to edges 107a and 107b, such that web 102 is generally placed in a horizontal plane. A supply of interlocking fastener strips 32 and 34 are guided into alignment with free edges 107a and 107b, and sealed thereto by sealer 108. Feeding mechanisms 204 generally guide and feed web 102. Rollers, belts, and similar devices are suitable as feeding mechanisms 204.

Sliders 48 are placed along fastener strips 32 and 34 by machine 114 in a manner previously described. Sliders 48 are positioned by arm 116 and receiver 118, a fused spot is created by horn 120 and sealing plate 122, and slider 48 is repositioned by arm 124 and receiver 126, all in a manner as previously described. A tamper evident seal 127, if desired, may be applied to container 20 by sealer 128 in a manner as previously described.

Prior to the formation of transverse seals, it is necessary to open the bottom edge 203 of container 20 for subsequent introduction of the product. A slitter 210 cuts through the fold. Slitter 210 is preferably a static mechanism that cuts bottom edge 203 as web 102 is pulled past slitter 210. Bottom edge 203 is cut into bottom free edges 222 and 224. Shortened rollers 212 continue to guide and feed web 102.

A pre-sealing mechanism 206 applies sufficient heat and pressure to web 102 to substantially flatten web 102 thereat, but not so much heat or pressure as to fuse the web sidewalls. This pre-sealing mechanism 206 substantially removes wrinkles that may exist in web 102. A sealing mechanism 208 creates partial transverse seals for container 20 at the flattened web position. Sealing mechanism 208 is preferably of a type that utilizes either heated metal bars or

electrical impulse sealing bars. Sealing mechanism 208 creates partial transverse seals 28' and 30' that extend substantially but not completely across sidewalls 22 and 24. Mechanism 208 fuses a partial transverse seal from free edges 107a and 107b across sidewalls 22 and 24 to a point about one-half inch away from bottom free edges 222 and 224. By not forming transverse seals completely across sidewalls 22 and 24, there remains a portion along bottom free edges 222 and 224 which is useful for guiding and feeding web 102 and also for subsequent opening and filling of container 20.

After forming partial transverse seals, a product is placed within container 20. Container 20 is useful for containing products that are generally flowing in nature, such as small pieces of candy, granular products, and liquids. For example, with products of the type which have a flowing nature it is preferable that container 20 be oriented in a substantially vertical manner as it continues to move horizontally. FIG. 5 schematically depicts an apparatus 200 in which a flowing product such as candy is being gravity fed from a hopper 214 into a container 20. Container opening mechanism 216 spreads apart bottom free edges 222 and 224 as the motion of web 102 is momentarily halted. Mechanism 216 may use mechanical fingers to hold and spread apart edges 222 and 224. Alternatively, mechanism 216 may incorporate suction devices that grasp and spread apart edges 222 and 224.

After introduction of the product into container 20, free edges 222 and 224 are fused together by bottom sealing mechanism 218. Mechanism 218 places a wide sealing area on container 20, such that a seal is formed that overlaps with partial transverse side seals 28' and 30'. In this way, the approximate one-half inch not sealed by sealing mechanism 208 is instead sealed by mechanism 218. Following the placement of a bottom seal, a cutting mechanism 230 severs adjacent containers 20 through the full transverse side seal 28 and 30. It may also be necessary to trim some of the sealed bottom edge of container 20.

Container 20 is also useful for larger products with a well defined shape, such as cheese and large candy bars. Web 102 may require reorientation based upon the type of product to be inserted within container 20. For placement within container 20 of those products that are large and have a definite shape it is preferable that web 102 be in a substantially horizontal plane, such that free edges 222 and 224 are at about the same elevation as fastener strips 32 and 34. FIG. 6 is a perspective schematic of apparatus 400, one embodiment of the present invention, for forming, filling, and sealing a container in a substantially horizontal manner. Apparatus 400 begins in a manner similar to that of apparatus 200. Web 102 is fed by rollers 204 along a substantially horizontal path, preferably in a vertical orientation. Alternatively, web 102 may be pulled in a horizontally planar orientation. Fastener strips 32 and 34 are attached and sealed to web 102, a slider 48 is placed on the strips, and a tamper evident seal, if desired, is attached.

In those embodiments in which web 102 is pulled by rollers 204 in a vertical orientation, there is a subsequent reorientation of web 102 to a horizontal plane. As web 102 passes through second roller set 204b there is a twist 402 of 90 degrees before web 102 passes through third set of rollers 204c. It is preferable to support the underside of the non-horizontal web 102. This support may be in the form of a belt or roller conveyor, for example.

A spreading mechanism 216' holds free edge 224 and lifts it vertically, creating opening 404 within web 102. In some embodiments it may be helpful to permit that portion of web

102 downstream of mechanism 216' to return toward mechanism 216', such that the lifting of free edge 224 does not unduly stress sidewall 22. A product is placed within sidewalls 22 and 24 of web 102 by placement mechanism 225 and free edge 224 is brought back into contact with edge 222. Transverse side seals 28 and 30 across web 102 are formed by sealing machine 208'. Sealing machine 208' places a full transverse seal across web 102. Sealing machine 208' must also separate sufficiently such that the product within container 20 may pass therebetween. Free edges 224 and 222 are then fused together by heat, ultrasonic energy, or other method by bottom sealer 218'. Bottom sealer 218' applies a slightly narrower seal than bottom sealer 218, because of the full transverse seal applied by sealing mechanism 208'. A cutting mechanism 230 then severs container 20 from web 102 through the transverse seals.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention are desired to be protected.

What is claimed is:

1. A method for placing a product in a flexible recloseable container, comprising:
 - feeding a web of flexible film with interlockable fastener strips;
 - orienting a slider to a predetermined orientation;
 - stopping the web of flexible film;
 - placing the slider over the fastener strips during said stopping;
 - moving the slider relative to the fastener strips such that the fastener strips are generally closed;
 - forming a transverse seal generally across the film; and
 - placing a product within the web.
2. The method of claim 1 which further comprises spreading apart the feet of the slider before said placing the slider.
3. The method of claim 1 which further comprises spreading apart at least one closure element of the fastener strips before said placing the slider.
4. The method of claim 1 wherein said feeding includes forming the web in a generally tubular shape.
5. The method of claim 4 wherein during said placing of the product the container is in a substantially vertical orientation.
6. The method of claim 1 wherein said feeding includes forming the web in a generally folded shape.
7. The method of claim 6 wherein during said placing of the product the container is in a substantially vertical orientation.
8. The method of claim 6 wherein during said placing of the product the container is in a substantially horizontal orientation.
9. The method of claim 1 which further comprises placing a tamper evident seal on the container.
10. A method for placing a product in a flexible recloseable container, comprising:
 - feeding a web of flexible film with interlocked fastener strips;
 - orienting a slider to a predetermined orientation;
 - spreading apart the feet of the slider;
 - unlocking the fastener strips;
 - placing the slider over the fastener strips;
 - interlocking the fastener strips;

forming a transverse seal generally across the film; and placing a product within the web.

11. The method of claim 10 which further comprises stopping the web of flexible film before said placing the slider.

12. The method of claim 10 which further comprises spreading apart at least one closure element of the fastener strips before said placing the slider.

13. The method of claim 10 wherein said feeding includes forming the web in a generally tubular shape.

14. The method of claim 13 wherein during said placing of the product the container is in a substantially vertical orientation.

15. The method of claim 10 wherein said feeding includes forming the web in a generally folded shape.

16. The method of claim 15 wherein during said placing of the product the container is in a substantially vertical orientation.

17. The method of claim 15 wherein during said placing of the product the container is in a substantially horizontal orientation.

18. The method of claim 10 which further comprises placing a tamper evident seal on the container.

19. An apparatus for placing a product in a flexible recloseable container, comprising:

means for feeding a web of flexible film with interlocked fastener strips, the strips including shoulders;

a slider for locking and unlocking the fastener strips, said slider having feet;

a probe for unlocking said interlocked fastener strips;

a slider application machine for placing said slider on the fastener strips, said slider application machine including a rotatable selector wheel and a spreading ridge, said wheel including a pocket for accepting said slider and moving said slider while said slider is in contact with said spreading ridge such that the feet are spread apart sufficiently to pass over the shoulders;

a sealing mechanism for forming at least a partial transverse seal generally across the film; and

means for placing a product within the web of flexible film;

wherein said probe unlocks said interlocked fastener strips before said sliders are placed on said unlocked fastener strips.

20. The apparatus of claim 19 which further comprises means for moving the slider relative to the fastener strips such that the fastener strips are generally closed.

21. The apparatus of claim 19 which further comprises a guide for orienting the fastener strips to accept said slider from the pocket.

22. The apparatus of claim 19 wherein said means for feeding stops the web when said selector wheel rotates to place said slider on the fastener strips.

23. The apparatus of claim 19 wherein said means for feeding forms the flexible film into a generally tubular shape.

24. The apparatus of claim 23 wherein said means for placing places the product within the web in a generally vertical manner.

25. The apparatus of claim 19 wherein said means for feeding forms the flexible film into a generally folded shape.

26. The apparatus of claim 25 wherein said means for placing places the product within the web in a substantially vertical orientation.

27. The apparatus of claim 25 wherein said means for placing places the product within the web in a substantially horizontal orientation.

28. The method of claim 1 wherein said fastener strips include two pairs of closure elements, and wherein during said feeding each of the two pairs of closure elements are interlocked.

29. The method of claim 28 which further comprises unlocking only one pair of closure elements prior to said placing the slider.

30. The method of claim 10 which further comprises stopping the web of flexible film, and wherein said placing the slider over the fastener strips is during said stopping.

31. The method of claim 10 wherein said fastener strips include two pairs of interlocked closure elements, and wherein during said unlocking only one pair of closure elements are unlocked.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,956,924
DATED : September 28, 1999
INVENTOR(S) : Ronald G. Thieman

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page.

Item [73], please insert -- **KCL** -- in place of "RCL"; and please insert -- Ind. -- in place of "Id."

Signed and Sealed this

Twenty-first Day of January, 2003

A handwritten signature in black ink, appearing to read "James E. Rogan", with a horizontal line drawn underneath it.

JAMES E. ROGAN
Director of the United States Patent and Trademark Office



US006442804B2

(12) **United States Patent**
Turvey et al.

(10) **Patent No.:** **US 6,442,804 B2**
 (45) **Date of Patent:** ***Sep. 3, 2002**

(54) **RECLOSABLE FASTENER ASSEMBLY WITH
 SLIDER CLOSED POSITION INDICATOR**

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(*) **Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(52) **U.S. Cl.** **24/399; 24/400; 24/390;**
24/433; 24/587

(58) **Field of Search** **24/399, 400, 433,**
24/390, 587; 350/105

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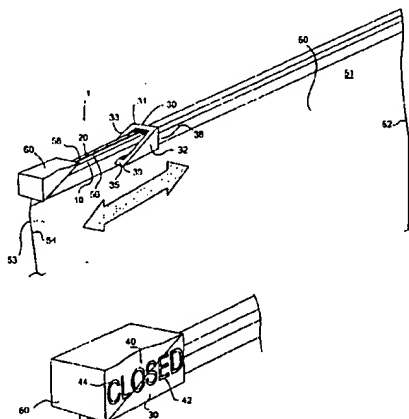
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Primary Examiner—Victor N. Sakran

(57) **ABSTRACT**

A reclosable fastener assembly includes first and second elongated closure elements that are engageable to form a seal. A slider is slidable relative to the closure elements between an open position and a closed position and is adapted (i) to engage the closure elements to one another when moved across the closure elements toward the closed position and (ii) to disengage the closure elements from one another when moved across the closure elements toward the open position. The slider carries a first partial indicator. A second partial indicator is located relative to the closure elements so as to complement the first partial indicator to form a visual indicator when the slider is in the closed position.

24 Claims, 5 Drawing Sheets



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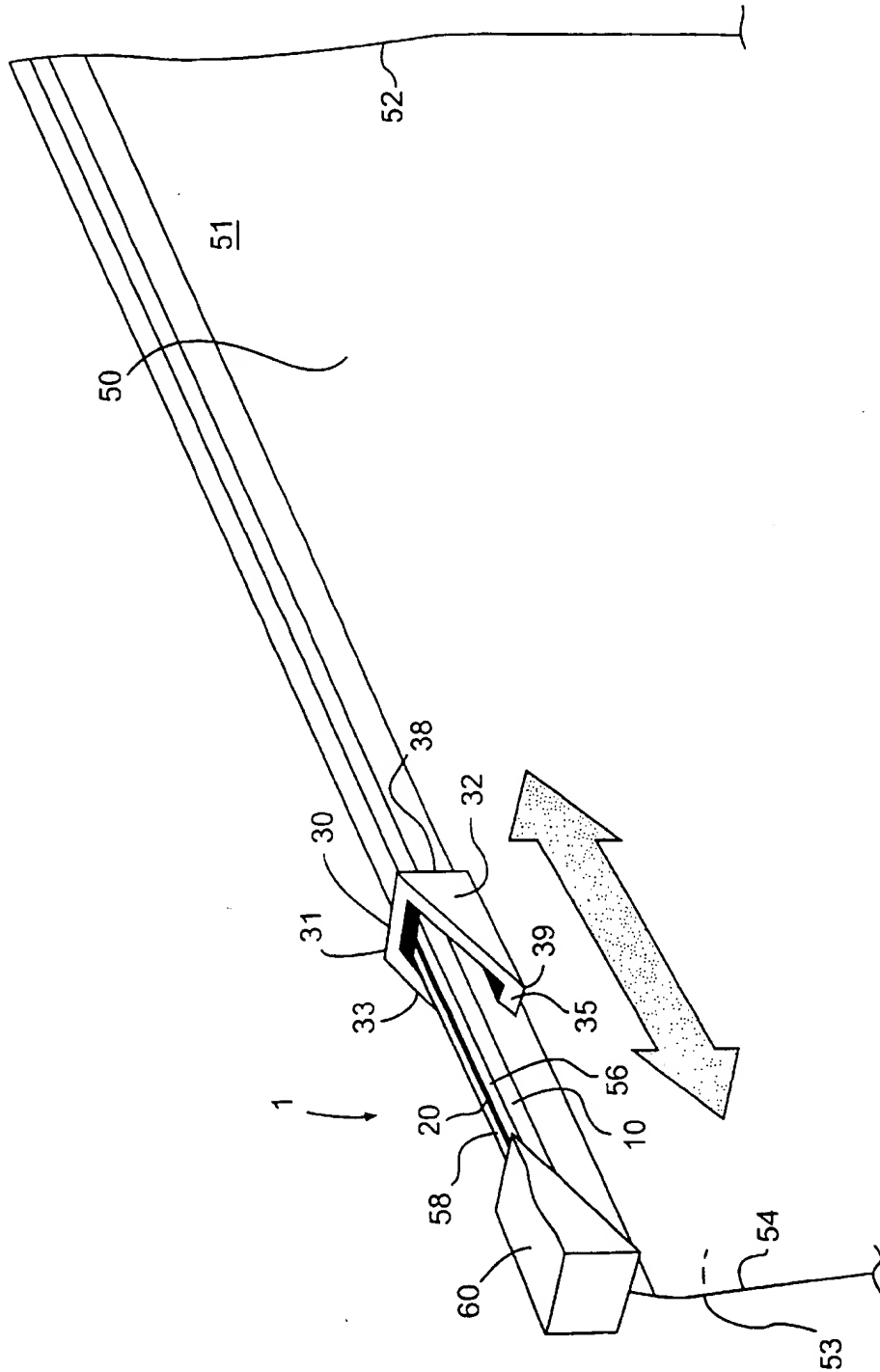


FIG. 1A

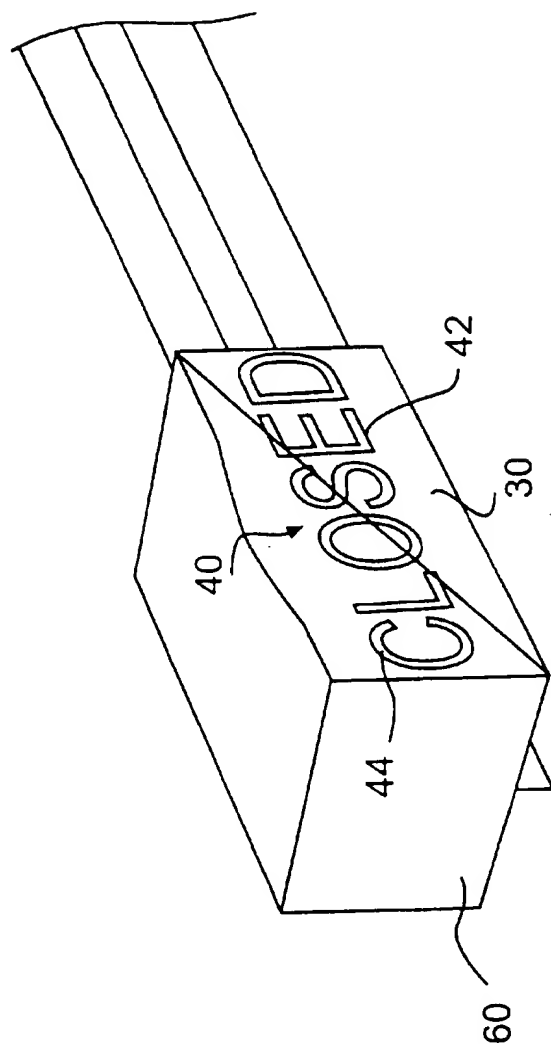
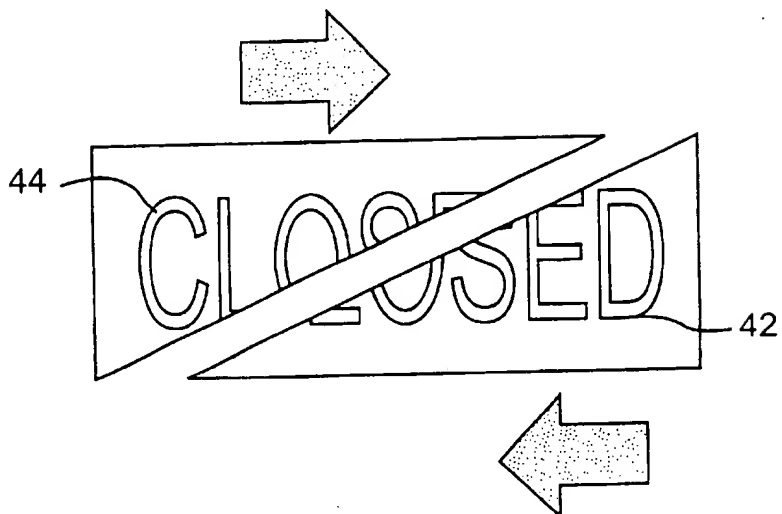
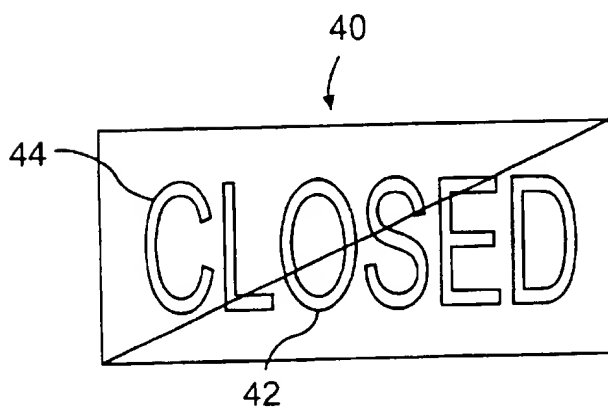
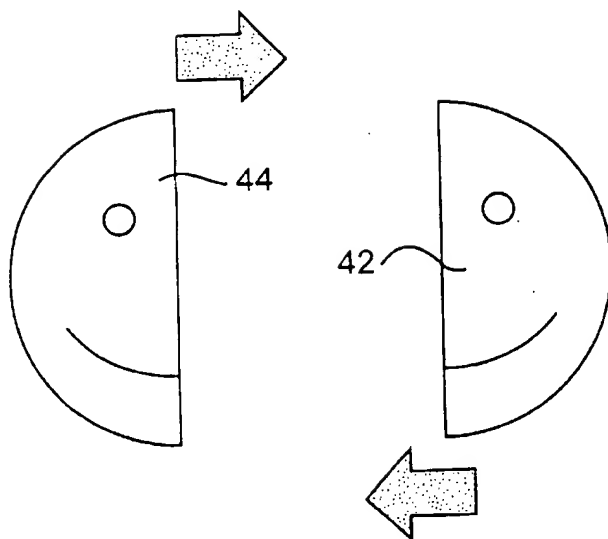
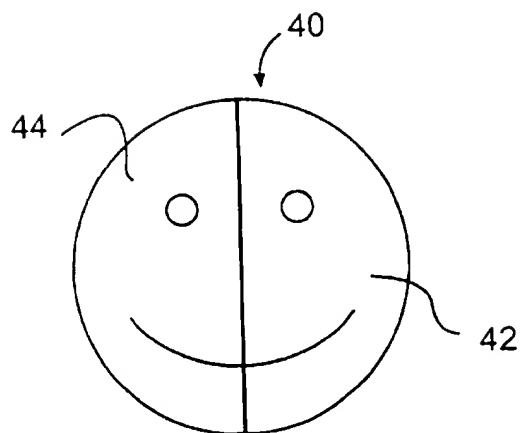


FIG. 1B

**FIG. 2A****FIG. 2B**

**FIG. 3A****FIG. 3B**

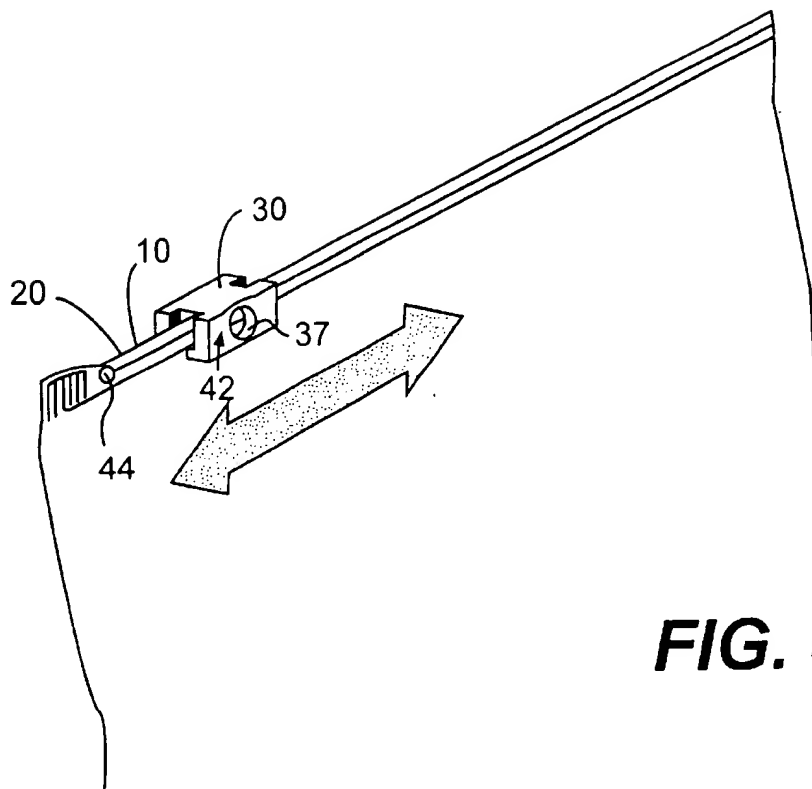


FIG. 4A

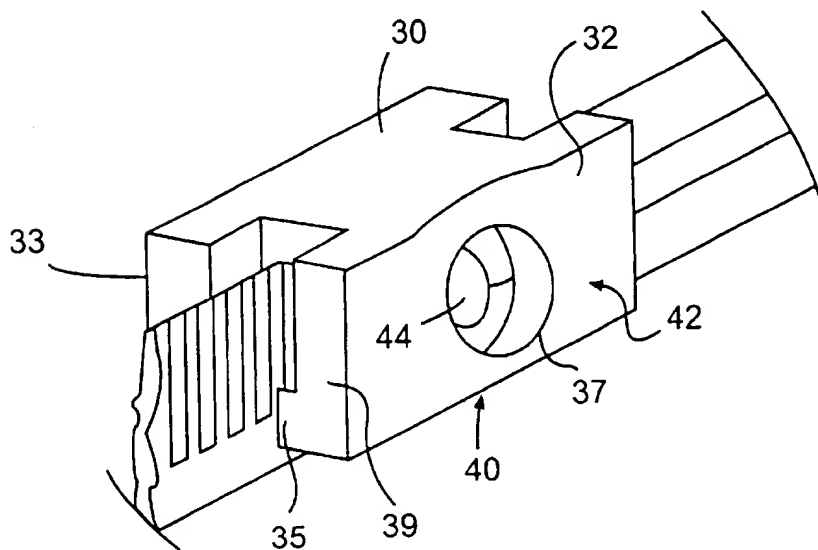


FIG. 4B

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RECLOSABLE FASTENER ASSEMBLY WITH SLIDER CLOSED POSITION INDICATOR

FIELD OF THE INVENTION

The present invention relates to reclosable fastener assemblies, such as the kind that is useful for sealing thermoplastic bags. More specifically, the present invention relates to such a fastener assembly which employs a slider by which the fastener assembly is opened and closed, and which provides a visual indicator of when the slider is in its closed position.

BACKGROUND OF THE INVENTION

Reclosable fastener assemblies are well known in the art, most commonly for use in sealing thermoplastic bags. Such fastener assemblies often include a pair of opposing, engageable closure elements that can be pressed together to form a seal and subsequently pried apart to release the seal. In many such fastener assemblies, commonly referred to as "zippers," the closure elements are complementary profiles that interlock when pressed together.

Some typical fastener assemblies are illustrated in U.S. Pat. No. 5,140,720 (interlocking rib and groove elements), U.S. Pat. No. 5,007,143 (rolling action zipper profile), and U.S. Pat. No. 3,173,184 (profiles having alternating hook-shaped closure elements).

Some fastener assemblies include a slider to facilitate engaging and disengaging of the closure elements. The slider rides on the closure elements, and, depending on the direction the slider is moved along the closure elements, the fastener assembly is either opened or closed. A typical slider brackets the closure elements and is configured so as to clamp the closure elements together when moved in one direction and to pry the closure elements apart when moved in the other direction. In some embodiments, the slider will include a separating element that fits between the closure elements in order to pry them apart. Such separating elements are illustrated in U.S. Pat. Nos. 4,262,395 (arrowhead-shaped separating element); 5,007,143 (tapered separating element); 3,173,184 (v-shaped separating element) and 5,067,208 (key-hole shaped separating element).

Certain reclosable fastener assemblies provide tactile and/or audible feedback as the slider moves across the closure elements. These typically involve detents or deformations in the closure elements that affect the feel and/or sound the closure elements produce as they are interlocked, such as in U.S. Pat. Nos. 5,138,750 and 5,722,128, or closure elements that elastically deform when interlocked, such as in U.S. Pat. No. 5,774,955. The former type provides feedback while the slider is being moved, but no real indication as to whether the fastener assembly is closed or open once the slider is at an end of the closure elements. The latter type does provide an indication of when the fastener assembly is closed, but that indication is rather subtle.

Other reclosable fastener assemblies provide visual feedback when the closure elements are engaged. These typically involve providing colored closure elements that combine to produce a color change when the closure elements are interlocked. Some examples are illustrated in U.S. Pat. Nos. 4,829,641; 4,907,321 and 5,356,222. Unless the closure profiles are sufficiently separated, this arrangement is only helpful when the user remembers which color indicates an open position of the closure elements.

Thus, it is not always easy for a user to tell at a glance whether a fastener assembly is closed or open. This is

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especially true for fastener assemblies that employ sliders, because the action of the slider typically does not separate the closure elements far enough that it is visually obvious when the fastener is open. Therefore, there is a need in the art for a reclosable fastener assembly, employing a slider, whereby a visual indicator is provided as to whether the slider is in its fully closed position.

SUMMARY OF THE INVENTION

The reclosable fastener assembly of the present invention addresses the foregoing needs in the art by providing complementary partial indicators that combine to form a visual indicator when the slider is in the closed position.

According to one aspect, the present invention relates to a reclosable fastener assembly, including first and second elongated closure elements engageable to form a seal. A slider is slidable relative to the closure elements between an open position and a closed position and is adapted (i) to engage the closure elements to one another when moved across the closure elements toward the closed position and (ii) to disengage the closure elements from one another when moved across the closure elements toward the open position. The slider carries a first partial indicator. A second partial indicator is located relative to the closure elements so as to complement the first partial indicator to form a visual indicator when the slider is in the closed position.

Preferably, the second partial indicator is stationary relative to the closure elements. Generally, the second partial indicator is located near an end of the closure elements.

The first and second partial indicators can comprise complementary portions of a pattern. The pattern can be a word, in which case the first and second partial indicators can include complementary portions of individual letters of the word. The pattern can also depict an object, which can be three dimensional.

A stop can be disposed so that the slider abuts the stop when the slider is in the closed position, and the second partial indicator can be provided on the stop.

Alternatively, the slider can include an opening through a side of the slider, and the second partial indicator can comprise a visible feature that is located so as to be visible through the opening of the slider when the slider is in the closed position. A pair of the openings can be provided, one each through opposite sides of the slider, in which case a pair of the visible features can be provided, each located so as to be visible through a different one of the pair of the openings of the slider when the slider is in the closed position. The feature can be provided on the surface of one of the closure elements, and can be a pigmented spot, for example.

According to another aspect, the present invention relates to a reclosable fastener assembly for selectively closing a mouth of a thermoplastic bag. The fastener assembly includes first and second elongated closure profiles disposed on opposing surfaces of the mouth of the bag. The first and second closure profiles are interlockable to seal the mouth of the bag. A slider brackets the closure profiles, and is slidable relative to the closure profiles between an open position and a closed position. The slider is adapted (i) to interlock the closure profiles when moved across the closure profiles toward the closed position and (ii) to disengage the closure profiles from one another when moved across the closure profiles toward the open position. The slider carries a first partial indicator. A second partial indicator is disposed relative to the closure profiles so as to combine with the first partial indicator to form a visual indicator when the slider is in the closed position.

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These and other objects, features and advantages of the present invention will be more apparent from the following description of the preferred embodiments, with reference to the following drawings, in which like reference numerals refer to like elements throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a partial perspective view of a thermoplastic bag employing a reclosable fastener assembly according to an embodiment of the present invention.

FIG. 1B is a detailed perspective view of an aspect of the fastener assembly illustrated in FIG. 1, in a closed position.

FIGS. 2A and 2B are schematic illustrations of partial indicators of a fastener assembly according to an embodiment of the present invention, in a partially open position and a closed position, respectively.

FIGS. 3A and 3B are schematic illustrations of partial indicators of a fastener assembly according to another embodiment of the fastener assembly of the present invention, in a partially open position and a closed position, respectively.

FIG. 4A is a partial perspective view of a thermoplastic bag employing a reclosable fastener assembly according to another embodiment of the present invention.

FIG. 4B is a detailed perspective view of an aspect of the fastener assembly illustrated in FIG. 4A, in a closed position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1A and 1B illustrate a reclosable fastener assembly 1 according to an embodiment of the present invention. The fastener assembly 1 includes first and second elongated closure elements 10, 20 that are engageable to form a seal. A slider 30, which can slide relative to the closure elements 10, 20 between a closed position (illustrated in FIG. 1B) and a fully open position (at the opposite end of the closure elements 10, 20), is adapted to promote engagement between the closure elements 10, 20 when moved across the closure elements 10, 20 toward its closed position, and disengage the closure elements 10, 20 from one another when moved across the closure elements toward its open position. The fastener assembly includes first and second partial indicators 42, 44, which are visible features that complement one another to form a visual indicator 40 when the slider 30 is in its closed position. The first partial indicator 42 is provided on the slider 30. The second partial indicator 44 is provided separate from the slider 30 and is positioned so as to complement the first partial indicator 42 and to form the visual indicator 40 when the slider 30 is moved to its closed position.

The reclosable fastener assembly 1 is useful, for example, for selectively closing the mouth of a thermoplastic bag 50. A typical thermoplastic bag 50 is formed of an opposing pair of flexible plastic sheets 51, 53, sealed together along a bottom (not shown) and two opposing side edges 52, 54. The top edges 56, 58 of the bag 50 are not sealed together, thereby forming an open mouth (to which the closure elements are affixed). The plastic sheets 51, 53 are typically made from any suitable thermoplastic film. Examples of suitable materials include low density polyethylene, linear low density polyethylene, substantially linear copolymers of ethylene, polypropylene, polyvinylidene chloride, other thermoplastic polymers, and blends of two or more of these. Pigment(s), ethylene vinyl acetate (for enhanced clarity), or the like, are often added.

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The closure elements 10, 20 typically comprise complementary profiles, facing one another, which can be interlocked substantially across their entire length to form a seal. The closure elements 10, 20 are engaged to one another by pressing them together. The closure elements 10, 20 are affixed to or near the top edges, 56, 58, respectively, of the plastic sheets 51, 53 of the bag 50 and face one another. The closure elements 10, 20 can be extruded separately and attached to the bag, or can be extruded integrally with the sheets forming the bag. The closure elements can take any of several forms known in the art, including profiles such as those noted above, shown in U.S. Pat. Nos. 5,140,720; 5,007,143 and 3,173,184.

As noted, the closure elements 10, 20 are engaged to and disengaged from one another by action of the slider 30. The construction and operation of the slider 30, insofar as it interacts with the closure elements 10, 20 to open and to close the fastener assembly 1, are not critical to the present invention and can take any suitable form. One suitable slider is illustrated in U.S. Pat. No. 5,722,128, incorporated herein by reference in its entirety.

The slider 30 will typically have a generally inverted U-shaped profile, with a top 31 that straddles across the closure elements and sides 32, 33 that depend from the top, one to either side of the closure elements 10, 20. At least a portion of the closure elements is bracketed by the sides 32, 33 of the slider. Typically, ridges 35 project inwardly from each side 32, 33 of the slider 30. The ridges 35 help to maintain the slider 30 on the closure elements 10, 20, and can assist in pressing the closure elements 10, 20 into engagement. The outer surfaces of the closure elements 10, 20 can be shaped to accommodate or provide a track for the ridges 35. The ridges 35 can extend substantially the entire length of the slider 30, or can be provided at either end of the slider 30.

Typically, the slider 30 will be tapered, so that either the sides 32, 33 or the ridges 35 are closer together at one end 38 (the "clamping" end) of the slider 30 than at the other end 39. As the slider 30 is moved toward its closed position, the clamping end 38 of the slider 30 trails. The closer spacing (between the sides 32, 33 or the ridges 35) acts to press the closure elements 10, 20 together, thereby forcing the closure elements 10, 20 to interlock.

A separating element (not shown) can depend from the top 31 between the sides 32, 33 of the slider. The separating element fits between the closure elements 10, 20. As the slider 30 is moved toward the fully open position, the separating element trails the clamping end 38 of the slider 30, so that the separating element pries the closure elements 10, 20 apart. As with the overall slider 30, the configuration of the separating element is not critical to the present invention.

The slider 30 can be formed in any suitable manner, including fabricating multiple parts which are secured together on the closure elements 10, 20 (by, for example, fusing, friction fitting, bondings, clamping, or the like), or a one-piece construction that is fit onto the closure elements. The slider 30 (or slider parts) can be formed using any suitable method, such as injection molding, and can be formed of any suitable material, such as, for example, polybutylene terephthalate, polypropylene, nylon, polystyrene, acetal, polyketone, high density polyethylene, polycarbonate, acrylonitrile butadiene styrene, or the like.

Optionally, a stop 60 can be provided at a position at which the slider 30 will abut the stop 60 when the slider 30 is in its closed position. This stop 60 can serve two func-

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tions. The stop 60 can prevent the slider 30 from sliding off the end of the closure elements 10, 20 once the slider 30 reaches its closed position. The stop 60 can also reinforce the edge 54 of the bag 50 and/or the ends of the closure elements 10, 20, thereby maintaining the sheets 51, 53 together at the edge 54 of the bag and/or the closure elements 10, 20 together at their ends. A similar stop (not shown) can be provided at the opposite end of the closure elements 10, 20 for the same reasons. The end stops 60 also provide a user with a convenient grip when moving the slider 30.

The construction and securement of the stops 60 are not critical to the present invention, and can be done in any suitable manner. For example, the stops 60 can be riveted, clamped, molded or fused either to the sheets 51, 53 or to the closure elements 10, 20, or can be formed integrally with the closure elements 10, 20, generally in a post-extrusion process. Examples of suitable stops are illustrated in U.S. Pat. Nos. 5,067,208 (riveted-on clips); 5,088,971 (molded from surrounding fastener material); 5,131,121 (ultrasonically formed); 5,161,286 (clamped-on clips); 5,405,478 (bonded end stops); 5,442,837 (sealed ends of profiles) and 5,448,807 (melted-on clips).

As noted above, the slider 30 includes the first partial indicator 42. The first partial indicator 42 can be formed integrally with the slider 30, or can be affixed to the slider 30, as long as the first partial indicator 42 moves with the slider 30.

The second partial indicator 44 is disposed relative to the closure elements 10, 20 so as to combine with the first partial indicator 42 to form a visual indicator 40 when the slider 30 is in its closed position. The second partial indicator 44 should be stationary relative to the closure elements 10, 20, and is preferably located near the end of the closure elements 10, 20.

In the embodiment illustrated in FIGS. 1A and 1B, the first and second partial indicators 42, 44 provide complementary portions of a pattern. The actual content of the pattern is not crucial to the present invention, although it is preferred that the pattern be chosen and divided so as to provide a clear indication of when the visual indicator 40 is and is not formed. For example, the pattern can be a word. In the embodiment illustrated in FIGS. 2A and 2B, the pattern is the word "CLOSED" divided between the first and second partial indicators 42, 44. If the pattern is a word, it is preferred that the first and second partial indicators 42, 44 include complementary portions of an individual letter or individual letters of the word (as in the embodiment shown in FIGS. 2A and 2B), thereby further emphasizing the disconnect of the partial first and second partial indicators 42, 44 when the slider 30 is not in its closed position. In another embodiment, illustrated in FIGS. 3A and 3B, the pattern depicts an image or object. The image or object can be two- or three-dimensional, and if desired, a well-known animated character, symbol, or the like.

In the embodiments illustrated in FIGS. 1A-3B, in which the first and second partial indicators 42, 44 comprise complementary portions of a pattern, it is preferred that the second partial indicator 44 be provided on the stop 60 that is near the closed position of the slider 30. However, this is not necessary to the invention, and the second partial indicator 44 can be provided integrally with the closure elements 10, 20 or another part of the fastener assembly 1, or can be a separate element affixed to the fastener assembly.

In another embodiment, illustrated in FIGS. 4A and 4B, the slider 30 includes an opening 37 through which a surface of the closure elements 10, 20 can be viewed. The opening

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37 can be located so that the closure elements 10, 20 are visible therethrough. Alternatively, the slider 30 can extend above or below the closure elements 10, 20, and the opening 37 can be positioned so that a different part of the fastener assembly 1 or bag 50 is visible therethrough. The opening 47 can be formed in any suitable manner. For example, if the slider is injection molded, the opening 47 can be formed during molding, in a post-mold operation (e.g., drilling), or by some combination of the two.

The slider 30 and opening 37 provide the first partial indicator 42. The second partial indicator 44 is a feature of the fastener assembly or bag that is located so as to be visible through the opening 37 of the slider 30 when the slider 30 is in its closed position. The second partial indicator 44 is positioned on the closure elements 10, 20, a different part of the fastener assembly 1, or the bag 50, depending on the location of the opening 37 of the slider 30 when the slider 30 is in its closed position. For example, the second partial indicator 44 can be a colored spot, pattern, icon, symbol, letter, word or the like that is provided on or is visible through an outer surface of one of the closure elements 10, 20. The second partial indicator 44 can be formed in any suitable manner, such as, for example, ink jet printing, contact printing, embossing, or the like.

If desired, openings 37 can be provided on each side 32, 33 of the slider 30, and corresponding second partial indicators 44 can be provided on each side of the bag.

Alternatively, multiple openings 37 can be provided on either or both sides 32, 33 of the slider 30, and corresponding second partial indicators 44 can be provided. In one arrangement, the slider 30 can include, as part of the first partial indicator 42, a portion of a pattern interspersed with and interrupted by the openings 37. The second partial indicator 44 can be a complementary portion of the pattern located so as to be visible through the openings 37 when the slider 30 is in its closed position. This arrangement has similarities to the embodiments discussed with reference to FIGS. 1A-3B, in that their first and second partial indicators 42, 44 comprise complementary portions of a pattern, and similarities to the embodiment discussed with reference to FIGS. 4A and 4B, in that visual indicator 40 is formed by aligning openings in the slider 30 with a visible feature of the fastener assembly 1.

In one example (not illustrated), the first partial indicator 42 on the slider 30 includes the word "CLOSED" printed thereon, except that a pair of the openings 37 is provided in place of the letters "O" and "E", respectively. The second partial indicator 44 is the word "OPEN" located so as to be visible when the slider 30 is not in its closed position and so as to be obscured when the slider 30 is in its closed position. The letters "O" and "E" of the word "OPEN" can be located so as to be visible through the openings 37 of the slider 30, thus completing the word "CLOSED" to form the visual indicator 40. Of course, other words or patterns can be used.

In yet another embodiment (not illustrated), the first partial indicator 42 is provided by a slider 30 that is see-through and color tinted. The second partial indicator 44 can be an underlying pattern in one color that is overlayed (and obscured) by a second color. The second partial indicator 40 is visible through the slider 30 when the slider 30 is in its closed position. The colors of the slider 30 and the second partial indicator 44 are chosen so that the second color is filtered by the slider 30 so that the underlying pattern becomes visible through the slider 30 to form the visible indicator 40. In a preferred version, the second color is provided in an overlying pattern. The user will know that the

overlying pattern indicates that the fastener assembly is open, while the underlying pattern indicates closed (such as, for example, the word "CLOSED").

While the present invention has been described with respect to what is at present considered to be the preferred embodiments, it should be understood that the invention is not limited to the disclosed embodiments. To the contrary, the invention is intended to cover various modifications and equivalent arrangements, some of which are discussed above, included within the spirit and scope of the appended claims. Therefore, the scope of the following claims is intended to be accorded the broadest reasonable interpretation so as to encompass all such modifications and equivalent structures and functions.

INDUSTRIAL APPLICABILITY

Fastener assemblies according to the present invention are particularly useful as resealable closures for thermoplastic bags. Such a fastener assembly provides ease of use by virtue of its employment of a slider to assist in opening and closing the fastener assembly. It also provides the user with a simple visual indication as to whether the slider is in its closed position.

We claim:

1. A reclosable bag fastener assembly, comprising:
first and second elongated closure elements engageable to form a seal;
a slider slidable relative to the closure elements between an open position and a closed position and being adapted (i) to engage the closure elements to one another when moved across the closure elements toward the closed position and (ii) to disengage the closure elements from one another when moved across the closure elements toward the open position;
a first partial indicator carried by the slider; and
a second partial indicator located relative to the closure elements so as to complement the first partial indicator to form a visual indicator when the slider is in the closed position.
2. The fastener assembly according to claim 1, wherein the second partial indicator is stationary relative to the closure elements.
3. The fastener assembly according to claim 1, wherein the second partial indicator is located near an end of the closure elements.
4. The fastener assembly according to claim 1, wherein the first and second partial indicators comprise complementary portions of a pattern.
5. The fastener assembly according to claim 4, wherein the pattern comprises a word.
6. The fastener assembly according to claim 5, wherein the first and second partial indicators include complementary portions of an individual letter of the word.
7. The fastener assembly according to claim 4, wherein the pattern depicts an object.
8. The fastener assembly according to claim 4, wherein the pattern is three-dimensional.
9. The fastener assembly according to claim 1, further comprising a stop disposed so that the slider abuts the stop when the slider is in the closed position, wherein the second partial indicator is provided on the stop.
10. The fastener assembly according to claim 1, wherein the slider includes an opening through a side of the slider, and wherein the second partial indicator comprises a visible feature that is located so as to be visible through the opening of the slider when the slider is in the closed position.

11. The fastener assembly according to claim 10, wherein a pair of the openings is provided, one each through opposite sides of the slider, and a pair of the visible features is provided, each located so as to be visible through a different one of the pair of the openings of the slider when the slider is in the closed position.

12. The fastener assembly according to claim 10, wherein the feature is provided on the surface of one of the closure elements.

13. A reclosable bag fastener assembly for selectively closing a mouth of a thermoplastic bag, the fastener assembly comprising:

first and second elongated closure profiles disposed on opposing surfaces of the mouth of the bag, the first and second closure profiles being interlockable to seal the mouth of the bag;

a slider bracketing the closure profiles, the slider being slidable relative to the closure profiles between an open position and a closed position and being adapted (i) to interlock the closure profiles when moved across the closure profiles toward the closed position and (ii) to disengage the closure profiles from one another when moved across the closure profiles toward the open position;

a first partial indicator carried by the slider; and

a second partial indicator disposed relative to the closure profiles so as to combine with the first partial indicator to form a visual indicator when the slider is in the closed position.

14. The fastener assembly according to claim 13, wherein the second partial indicator is stationary relative to the closure profiles.

15. The fastener assembly according to claim 13, wherein the second partial indicator is located near an end of the closure profiles.

16. The fastener assembly according to claim 13, wherein the first and second partial indicators comprise complementary portions of a pattern.

17. The fastener assembly according to claim 16, wherein the pattern comprises a word.

18. The fastener assembly according to claim 17, wherein the first and second partial indicators include complementary portions of an individual letter of the word.

19. The fastener assembly according to claim 16, wherein the pattern depicts an object.

20. The fastener assembly according to claim 16, wherein the pattern is three-dimensional.

21. The fastener assembly according to claim 13, further comprising a stop disposed so that the slider abuts the stop when the slider is in the closed position, wherein the second partial indicator is provided on the stop.

22. The fastener assembly according to claim 13, wherein the slider includes an opening through a side of the slider, wherein the second partial indicator comprises a visible feature that is located so as to be visible through the opening of the slider when the slider is in the closed position.

23. The fastener assembly according to claim 22, wherein a pair of the openings is provided, one each through opposite sides of the slider, and a pair of the visible features is provided, each located so as to be visible through a different one of the pair of the openings of the slider when the slider is in the closed position.

24. The fastener assembly according to claim 22, wherein the feature is provided on the surface of one of the closure profiles.

* * * * *



US006488410B2

(12) **United States Patent**
Schneider(10) **Patent No.: US 6,488,410 B2**(45) **Date of Patent: Dec. 3, 2002**(54) **TAMPER-EVIDENT RECLOSABLE
PACKAGING WITH SLIDE/ZIPPER
ASSEMBLY AND HEADER**(75) **Inventor: John H. Schneider, Frankfort, IL (US)**(73) **Assignee: Illinois Tool Works Inc., Glenview, IL
(US)**(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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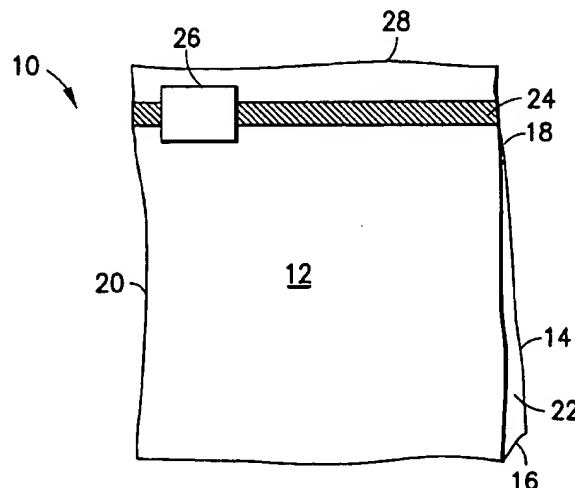
US 2002/0094138 A1 Jul. 18, 2002

Related U.S. Application Data(63) **Continuation-in-part of application No. 09/761,500, filed on
Jan. 16, 2001.**(51) **Int. Cl.⁷ B65D 33/34**(52) **U.S. Cl. 383/5; 383/64; 383/203;
383/210; 53/412**(58) **Field of Search 383/5, 64, 203,
383/210, 211, 61.2, 61.3; 24/399, 400;
53/412; 493/213**(56) **References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—Jes F. Pascua(74) *Attorney, Agent, or Firm—Ostrager Chong & Flaherty
LLP*(57) **ABSTRACT**

A reclosable packaging having a slider/zipper assembly, a header and a tamper-evident feature which undergoes a tangible change when the slider is moved relative to the header for the first time. The tamper-evident feature comprises a layer of sticky or adhesive material placed between a surface of the header and an opposing surface of the slider, thus forming a seal. The material must have a peel strength or resistance to rupture sufficient to resist an initial movement of the slider along the zipper. If the slider is stuck or adhered to the header, this indicates that the package or bag has not been tampered with, i.e., previously opened. When sufficient force is applied, the seal can be broken, allowing the slider to move relative to the header along the zipper in the direction of opening. Once broken, the seal cannot be restored by simply returning the slider to its original position and pressing the slider against the sticky or adhesive material. Thus the slider remains in an unsealed state which is readily detectable by the consumer, thereby providing a tangible indication that the package has been previously opened.

22 Claims, 3 Drawing Sheets

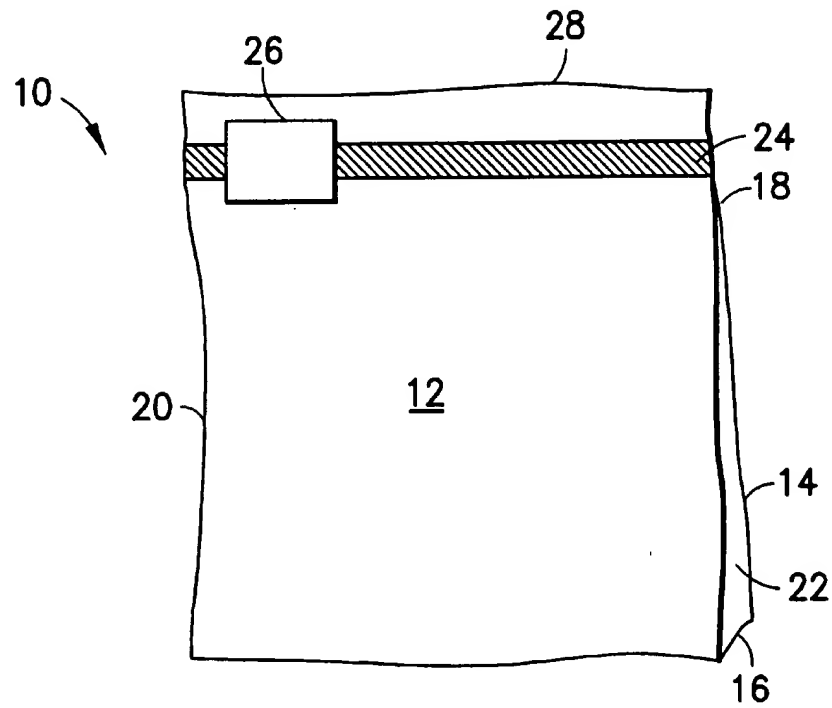


FIG. 1

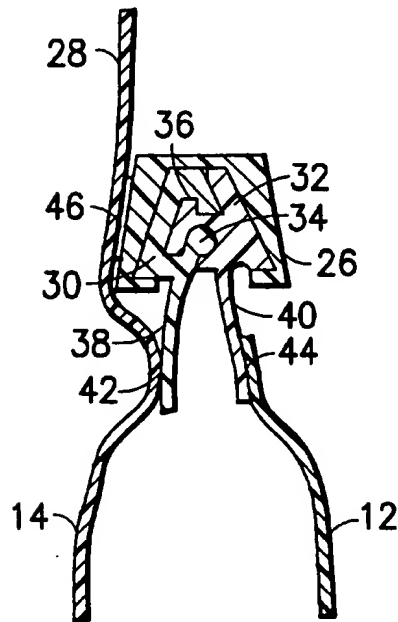


FIG. 2

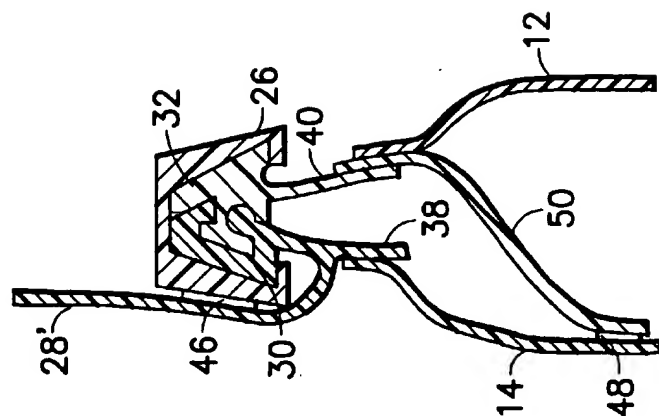


FIG. 5

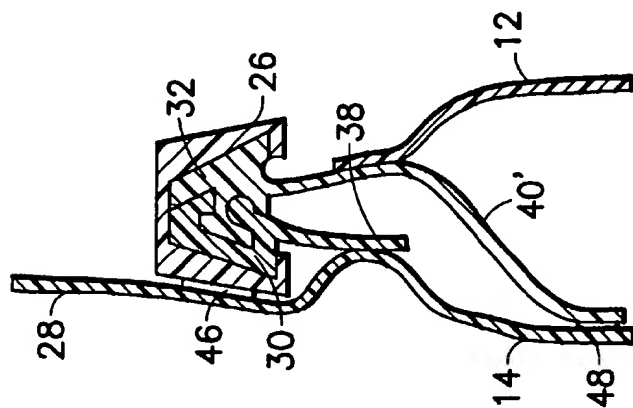


FIG. 4

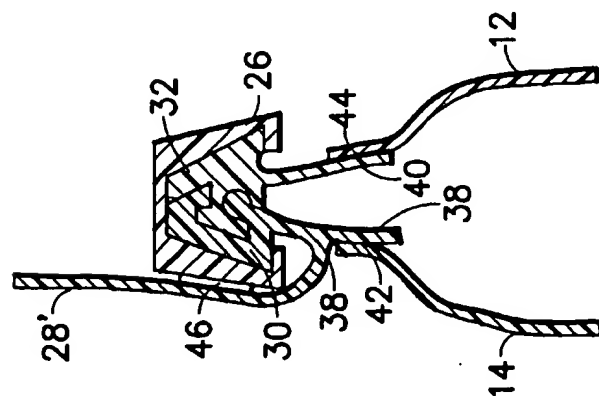


FIG. 3

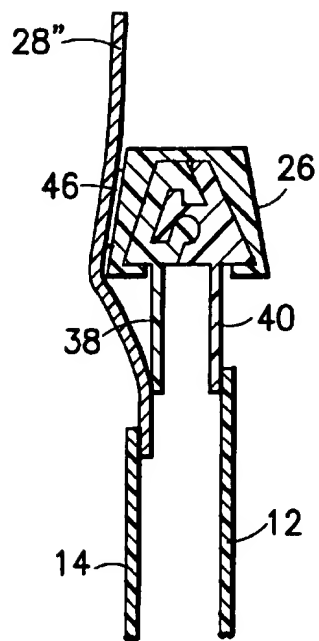


FIG. 6

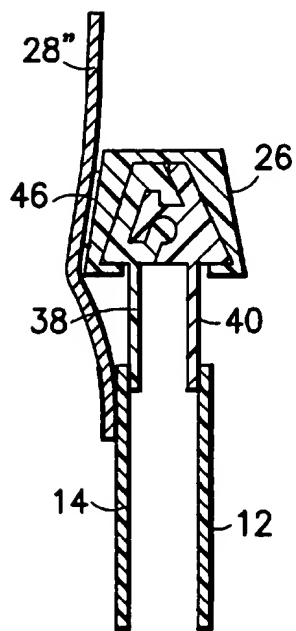


FIG. 7

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TAMPER-EVIDENT RECLOSABLE PACKAGING WITH SLIDE/ZIPPER ASSEMBLY AND HEADER

RELATED PATENT APPLICATION

This application is a continuation-in-part application claiming priority from U.S. patent application Ser. No. 09/761,500 filed on Jan. 16, 2001.

FIELD OF THE INVENTION

The present invention relates to reclosable packaging and in particular to such packaging wherein indicia are provided to indicate the first opening of the package.

BACKGROUND OF THE INVENTION

In the use of plastic bags and packages, particularly for foodstuffs, it is important that the bag be hermetically sealed until the purchaser acquires the bag and its contents, takes them home, and opens the bag or package for the first time. It is then commercially attractive and useful for the consumer that the bag or package be reclosable so that its contents may be protected. Flexible plastic zippers have proven to be excellent for reclosable bags, because they may be manufactured with high-speed equipment and are reliable for repeated reuse.

A typical zipper is one which has a groove at one side of the bag mouth and a rib at the other side, which rib may interlock into the groove when the sides of the mouth of the bag are pressed together. Alternatively, a member having a plurality of ribs may be on one side of the bag mouth, while a member having a plurality of channels may be on the other side, the ribs locking into the channels when the sides of the mouth of the bag are pressed together. In such a case, there may be no difference in appearance between the two members, as the ribs may simply be the intervals between channels on a strip which may lock into another of the same kind. In general, and in short, some form of male/female interengagement is used to join the two sides of the bag mouth together. The so-called members, or strips, are bonded in some manner to the material from which the bags themselves are manufactured. Usually, pull flanges extend above the rib and groove strips, which pull flanges may be pulled apart for access to the interior of the bag.

Although flexible zippers of this variety are quite popular, they do not always prevent the inadvertent or unwelcome opening of a bag or package within the store, and various additions have been made to provide tamperevident seals which would reveal when it has been opened prior to purchase. The problem of providing a tamper-evident zipper is exacerbated in package designs wherein the zipper is provided with a slider. While a slider facilitates a consumer opening and reclosing the package and hence is desirable in some instances, the slider makes it difficult for the manufacturer to employ conventional techniques to render the package tamper evident.

It is known to provide a zipper package construction which is designed to undergo some permanent change in the package appearance when the package is opened for the first time. In particular, it is known to provide a zipper package with a tamper-evident, non-reclosable peel seal which gives a positive indication of having been broken when a package is first opened and which is non-reclosable after being first opened.

Such zipper package constructions should also have other desirable features. For example, the package should be "user

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friendly" in the sense that the steps necessary for the initial opening of the package prior to the use of the zipper are obvious or intuitive to the consumer. Also the zipper package design should allow the package to be formed on conventional packaging equipment with little or no modification of the equipment being required. In cases where the zipper packaging includes a slider, the tamperevident feature should be compatible with the slider. Similarly, where the package contents require hermetic sealing, it is desirable that the tamper-evident feature also permit such hermetic sealing.

SUMMARY OF THE INVENTION

The present invention is directed to a reclosable packaging having a slider/zipper assembly, a header and a tamperevident feature which undergoes a tangible change when the slider is moved relative to the header for the first time. The tamperevident feature comprises a layer of sticky or adhesive material placed between a surface of the header and an opposing surface of the slider, thus forming a seal. The material must have a peel strength or resistance to rupture sufficient to resist an initial movement of the slider along the zipper. If the slider is stuck or adhered to the header, this indicates that the package or bag has not been tampered with, i.e., previously opened. When sufficient force is applied, the seal can be broken, allowing the slider to move relative to the header along the zipper in the direction of opening. Once broken, the seal cannot be restored by simply returning the slider to its original position and pressing the slider against the sticky or adhesive material. Thus the slider remains in an unsealed state which is readily detectable by the consumer, thereby providing a tangible indication that the package has been previously opened.

The reclosable packaging incorporating the foregoing feature may comprise a front wall, a rear wall opposite to the front wall, a bottom wall connecting the bottom edges of the front and rear walls, and left and right side walls connecting opposing side edges of the front and rear walls and also connected to the bottom wall. However, the tamperevident feature disclosed herein may also be used in pouches or bags having other shapes, e.g., bags with no bottom or side panels and the bottom and side edges of the front and rear walls heat sealed together; and so forth. The zipper typically comprises a pair of complementarily profiled, extruded plastic fastener strips. The first fastener strip comprises a first interlockable member having a first profile and is attached to the front wall of the packaging; the second fastener strip comprises a second interlockable member having a second profile and is attached to the rear wall of the package. The second interlockable member is interlocked with the first interlockable member for closing the top of the package. A slider is slidably positioned over the interlockable portions of the fastener strips for movement along the zipper from side to side of the package. The slider causes the profiled interlockable members to disengage when moved in the direction of the closing end of the slider, allowing access to the contents of the package, and causes the profiled interlockable members to interlock when moved in the direction of the opening end of the slider.

In accordance with one preferred embodiment of the present invention, the slider is initially, i.e., prior to the first opening, constrained by a peel seal comprising a layer of sticky or tacky material placed between the slider and the header. In accordance with another preferred embodiment, the slider is constrained by an adhesive seal comprising a layer of adhesive material. In either case, the seal must be removed or ruptured or delaminated to permit movement of

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the slider relative to the header and thus provide access to the package contents. As long as the seal is intact, the consumer is assured that the slider has not been previously moved or slid along the zipper. Only during the initial access to the package contents, when the slider is moved relative to the header for the first time, will the integrity of the seal be disrupted. The broken seal produces tangible evidence that the package has been previously opened.

In accordance with a first preferred embodiment of the invention, the header to which the slider is tacked is integrally formed as an extension of the rear wall of the package or bag.

In accordance with a second preferred embodiment of the invention, the header to which the slider is tacked is integrally formed as an extension of the flange of one of the fastener strips.

In accordance with a third preferred embodiment of the invention, the header to which the slider is tacked is formed as a separate piece which is heat sealed or welded to either the rear wall of the package or bag or to the flange of one of the fastener strips.

In accordance with another preferred embodiment of the invention, the tacked slider combinations are further combined with features that provide a hermetically sealed package.

A person skilled in the art will readily appreciate that, instead of applying a layer of sticky or adhesive material on the header or slider, a strip bearing a layer of sticky or adhesive material can be heat sealed or welded to the header or slider.

In each of the above cases, a step that must be taken before the initial opening of the package results in a physical altering of the sealed package which may readily be observed or discovered by a consumer.

Other aspects of the invention are disclosed and claimed below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a drawing showing a front perspective view of a reclosable package in accordance with the preferred embodiments of the invention.

FIG. 2 is a drawing showing a fragmentary sectional view of the zippered portion of a reclosable package in accordance with a first preferred embodiment of the invention.

FIG. 3 is a drawing showing a fragmentary sectional view of the zippered portion of a reclosable package in accordance with a second preferred embodiment of the invention.

FIG. 4 is a drawing showing a fragmentary sectional view of the zippered portion of a reclosable package of the type shown in FIG. 2 with a hermetic sealing feature added.

FIG. 5 is a drawing showing a fragmentary sectional view of the zippered portion of a reclosable package of the type shown in FIG. 3 with a hermetic sealing feature added.

FIGS. 6 and 7 are drawings showing fragmentary sectional views of the zippered portion of reclosable packages in accordance with a third preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made to the drawings in which similar members in different drawings bear the same reference numerals. FIG. 1 depicts a reclosable package 10 comprising a front wall 12 and a rear wall 14 that is opposite

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to the front wall. The package further has a bottom panel 16, a top end 18 and left and right sides 20, 22. The walls, bottom panel and sides are typically formed from thermoplastic film heat sealed as necessary to form hermetically sealed junctures for the various portions of the package. A zipper 24 is provided at the package top end. A slider 26 is provided on the zipper to facilitate its opening and closing. To this end, moving the zipper slider toward one side 22 disengages the interlocking members of the zipper fastener strips and moving the slider toward the opposite side 20 brings the interlockable members of the zipper fastener strips into engagement. The reclosable package shown in FIG. 1 further comprises a header 28, which may be a panel or strip formed from the same material as that comprising the walls of the package or from the same material as that comprising the zipper or from an entirely separate material.

In accordance with preferred embodiments of the present invention, after the package has been filled with product, the zipper is closed by moving the slider 26 to the position shown in FIG. 1. When the slider is in the closed position, a layer of sticky or adhesive material is placed between the slider 26 and the header 28. Alternatively, the layer of sticky or adhesive material can be applied to the header before the slider is moved to the closed position, the material being applied on the surface portion of the header which will oppose the slider in the closed position or on the rear external surface of the slider which faces the header. In either event, when the slider is in the closed position, the sticky or adhesive material will be in contact with both the rear external surface of the slider and the opposing surface portion of the header. The sticky or adhesive material will hold the slider in its closed position until such time that sufficient force is applied to break the seal formed by the sticky or adhesive material. This may be accomplished by prying the header back and away from the slider or by gripping the slider and forcing it to slide laterally along the zipper in the direction of opening.

Referring to FIG. 2, it can be seen that the zipper 24 consists of a first fastener strip 30 and a second fastener strip 32. Fastener strip 30 is provided with a first interlockable member 34 and fastener strip 32 is provided with a second interlockable member 36 that is engageable with the first interlockable member 34. Numerous configurations for the interlockable members 34, 36 are well known in the art. Fastener strip 30 further includes a flange 38 that extends toward the interior of the package and fastener strip 32 further includes a similar flange 40. Flange 38 is attached to package wall 14 by a "hard" seal 42, that is, a seal which is not intended to be broken. Similarly, flange 40 is attached to package wall 12 by a "hard" seal 44. In accordance with the first preferred embodiment shown in FIG. 2, the package wall 14 also includes a portion that extends past and over the seal point 42, and continues beyond the seal point 42 to form the header 28. The header 28 may be provided with an aperture (not shown) for receiving a hook for suspending the package on a display rack.

As seen in FIG. 2, a layer of sticky or adhesive material is placed between a rear external surface of the slider 26 and an opposing area on the front surface of the header 28, forming a seal 46. As long as the seal 28 is unbroken, this indicates that the slider has not been moved from its initial closed position generally depicted in FIG. 1. The seal 46 effectively joins the slider and the header, the rupture resistance of the seal producing a corresponding resistance to lateral displacement of the slider relative to the header and along the zipper axis in the direction of opening. Thus, the fact that the slider 26 is tacked or anchored to the header 28

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indicates that the package has not been previously opened, i.e., is free of tampering or pilfering. Once the seal is ruptured or removed, the slider is loosened and able to move relative to the header. This loosened state of the slider serves as an indication that the package may have been previously opened, i.e., tampered with. Preferably graphics are provided on the header or on a wall of the package that indicate the presence of the tamper-evident feature and explain how to use this feature for consumer protection.

An alternative preferred embodiment is generally depicted in FIG. 3. The only structural difference between the preferred embodiments respectively shown in FIGS. 2 and 3 is that in the embodiment of FIG. 3, the header 28' is integrally formed as an extension from the flange 38 of the fastener strip 30, whereas in FIG. 2 the header 28 is shown as being an extension of the rear wall 14. The header 28' preferably has a thickness which allows the header 28' to flex rearward, away from the slider 26. The consumer can pry the header rearward or move the slider in order to rupture the seal 46, which is again preferably formed by a layer of sticky or adhesive material. During the prying operation, either the seal 46 ruptures or the seal is peeled away from the slider or from the header.

Instead of being integrally formed as an extension of a zipper flange or a package wall, the header may comprise a panel of thermoplastic material which is heat sealed or ultrasonically welded to either a zipper flange or a package wall. Two variations of this embodiment are respectively shown in FIGS. 6 and 7. In the embodiment of FIG. 6, the header 28" is a separate piece of thermoplastic material having a first portion which is preferably heat sealed to wall 14 and having a second portion which is preferably heat sealed to the zipper flange 38. In the embodiment of FIG. 7, the header 28" is a separate piece of thermoplastic material having a portion which is preferably heat sealed to wall 14, which wall is in turn preferably heat sealed to the zipper flange 38. In both cases the slider 26 is tacked or adhered to the header 28" by means of a seal 46 preferably formed by a layer of sticky or adhesive material.

As previously noted, the tamper-evident feature disclosed herein also has application in packages comprising front and rear walls heat sealed at their side and bottom edges, i.e., so-called "pillow" package. FIGS. 4 and 5 respectively show the tamper-evident feature in accordance with the first and second preferred embodiments of FIGS. 1 and 2, incorporated in a "pillow" package. In these applications, an optional internal hermetic peel seal may be provided as shown in FIGS. 4 and 5.

FIG. 4 shows a package incorporating the tamper-evident feature of FIG. 2 and an internal hermetic peel seal. The internal hermetic peel seal is provided by extending the flange of the zipper fastener strip 32 to form a web 40'. The distal edge of the web 40' is sealed to the rear wall 14 by means of a layer 48 of peel seal material. Although not visible in FIG. 4, the side edges of the web 40' are captured in the side seals for the front and rear walls of the "pillow" package, thereby ensuring that the web 40' is caulked on all sides to hermetically seal the package contents.

FIG. 5 shows a package incorporating the tamper-evident feature of FIG. 3 and an internal hermetic peel seal. The internal hermetic peel seal in this embodiment is provided by hard sealing a proximal edge of a separate web 50 between the zipper flange 40 and the front wall 12, and peel sealing the distal edge of web 50 to the rear wall 14 by means of a layer 48 of peel seal material. Again the side edges of the web 50 must be captured in the side seals for

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the front and rear walls of the "pillow" package to ensure that the package contents are hermetically sealed.

The preferred material for tacking the slider to the header is a so-called "peel seal" material. Peel seal materials are well known in the art. Alternatively, a peel-sealable laminated film strips or tape may be used. Peelable films of this type are designed to be heat-sealed to themselves or to other films, and to be peeled apart under known, predictable forces. When peeled apart, the separation mechanism is delamination within the peelable film itself. The delamination, which comprises one layer peeling off of its neighboring layer within the film structure, occurs because the bond between the two layers is weaker than the bond between the peelable film and the material to which it is sealed. These films, when peeled open, usually show a frosted white imprint indicating where they had been sealed together.

The present invention is further directed to a method of tamperproofing a package of the types shown in the drawings. In particular, the tamperproofing method applies to a receptacle having a mouth at an upper end, a flexible zipper attached to the mouth, a slider coupled to the zipper, and a header extending upward and having a free end. The method comprises the steps of filling the receptacle with contents while the zipper is open; moving the slider to a closed position to close the zipper; and tacking or adhering the slider to the header while the slider is in the closed position.

While the invention has been described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for members thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation to the teachings of the invention without departing from the essential scope thereof. Therefore it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. A package comprising walls secured together to define a receptacle space having a mouth at an upper end, a flexible zipper attached to said mouth and in a closed state, a slider coupled to said zipper for opening said zipper when said slider is moved along said zipper in a direction of opening, a header panel extending upward and having a free end, and a seal which affixes said slider relative to said header panel, said slider being slidable along said zipper when said seal is broken.

2. The package as recited in claim 1, wherein said seal comprises a layer of peel seal material in contact with said slider and said header panel.

3. The package as recited in claim 1, wherein said seal comprises a layer of adhesive material in contact with said slider and said header panel.

4. The package as recited in claim 1, wherein said seal comprises a peel-sealable laminated film strip.

5. The package as recited in claim 1, wherein said header panel is integrally formed as an extension of one of said walls.

6. The package as recited in claim 1, wherein said zipper comprises first and second interlockable fastener strips, and said header panel is integrally formed as an extension of one of said first and second interlockable fastener strips.

7. The package as recited in claim 1, wherein said header panel is attached to one of said walls.

8. The package as recited in claim 1, wherein said zipper comprises first and second interlockable fastener strips, and

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said header panel is attached to one of said first and second interlockable fastener strips.

9. The package as recited in claim 1, further comprising an internal hermetic peel seal.

10. A package comprising walls secured together to define a receptacle space having a mouth at an upper end, a flexible zipper attached to said mouth and in a closed state, a slider coupled to said zipper for opening said zipper when said slider is moved along said zipper in a direction of opening, a header panel extending upward and having a free end, and frangible means for affixing said slider relative to said header panel, said slider being slidable along said zipper when said frangible means are broken.

11. The package as recited in claim 10, wherein said frangible means comprise a peel seal.

12. The package as recited in claim 10, wherein said frangible means comprise adhesive.

13. The package as recited in claim 10, further comprising an internal hermetic peel seal.

14. A header bag comprising a receptacle having a mouth at an upper end, a flexible zipper attached to said mouth and in a closed state, a slider coupled to said zipper for opening said zipper when said slider is moved along said zipper in a direction of opening, a header extending upward above said mouth, and a layer of material which holds said slider in a fixed closed position relative to said header until a force exceeding a predetermined threshold is applied.

15. The header bag as recited in claim 14, wherein said layer of material comprises peel seal material.

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16. The header bag as recited in claim 14, wherein said layer of material comprises adhesive.

17. The header bag as recited in claim 14, wherein said header extends from one of said walls.

18. The header bag as recited in claim 14, wherein said zipper comprises first and second interlockable fastener strips, and said header extends from one of said first and second interlockable fastener strips.

19. The header bag as recited in claim 14, further comprising an internal hermetic peel seal.

20. A method of tamperproofing a package comprising a receptacle having a mouth at an upper end, a flexible zipper attached to said mouth, a slider coupled to said zipper, and a header extending upward and having a free end, comprising the steps of: filling said receptacle with contents while said zipper is open; moving said slider to a closed position to close said zipper; and tacking or adhering said slider to said header while said slider is in said closed position.

21. The method as recited in claim 20, wherein said tacking or adhering step comprises the step of applying a layer of sticky or adhesive material on a rear external surface of said slider.

22. The method as recited in claim 20, wherein said tacking or adhering step comprises the step of applying a layer of sticky or adhesive material on a surface portion of said header which confronts a rear external surface of said slider in said closed position.

* * * * *



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(12) **United States Patent**
Boy(10) **Patent No.:** **US 6,248,050 B1**
(45) **Date of Patent:** **Jun. 19, 2001**(54) **METHOD OF MAKING A HANGING FILE FOLDER AND THE FOLDER MADE THEREBY**5,707,001 1/1998 Mark et al. 229/67.2
5,769,772 * 7/1998 Wiley 493/213
5,944,423 * 8/1999 Rabin et al. 229/67.2(75) Inventor: **Lee A. Boy**, Jamestown, NC (US)(73) Assignee: **Esselte Corporation**, Garden City, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(58) Field of Search 229/67.2; 493/213, 493/212, 374, 379, 380, 947; 382/22

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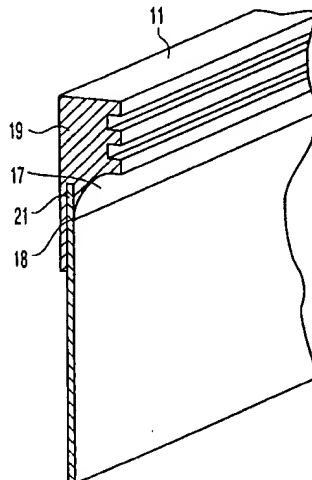
OTHER PUBLICATIONS

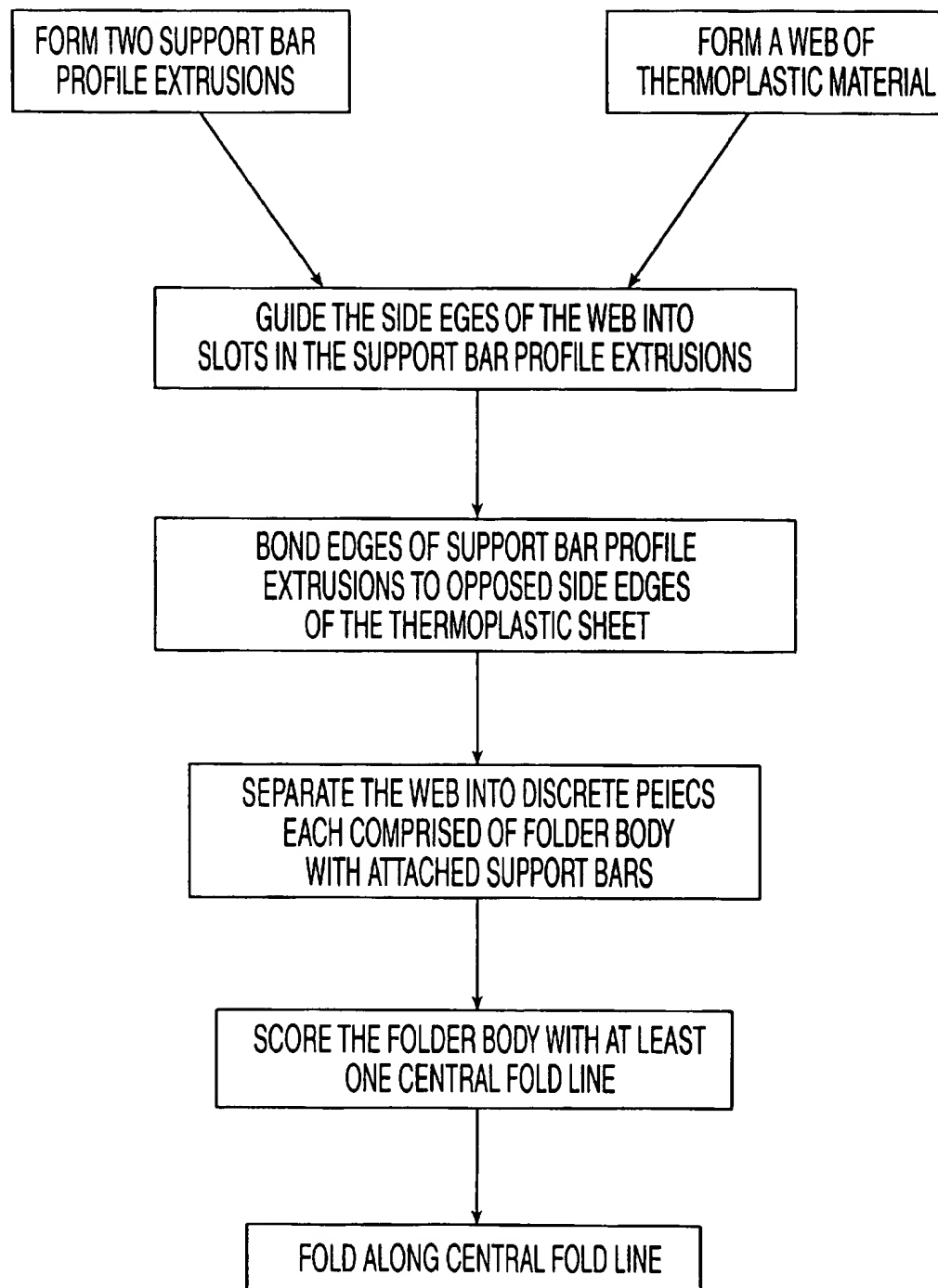
Magnetic Media Hanging Folder Product: a see-through vinyl hanging folder with designated pockets for mag cards, diskettes and hard copies, commercially available from approximately 1982–1984 in 8 styles, including legal size and letter size. Advertising and marketing literature provided, showing all 8 styles. Photocopy is provided of the only Magnetic Media Hanging Folder Product known to still exist. Also included are photographs of this Product showing: front view on a dark background, and front and back views on a light background.

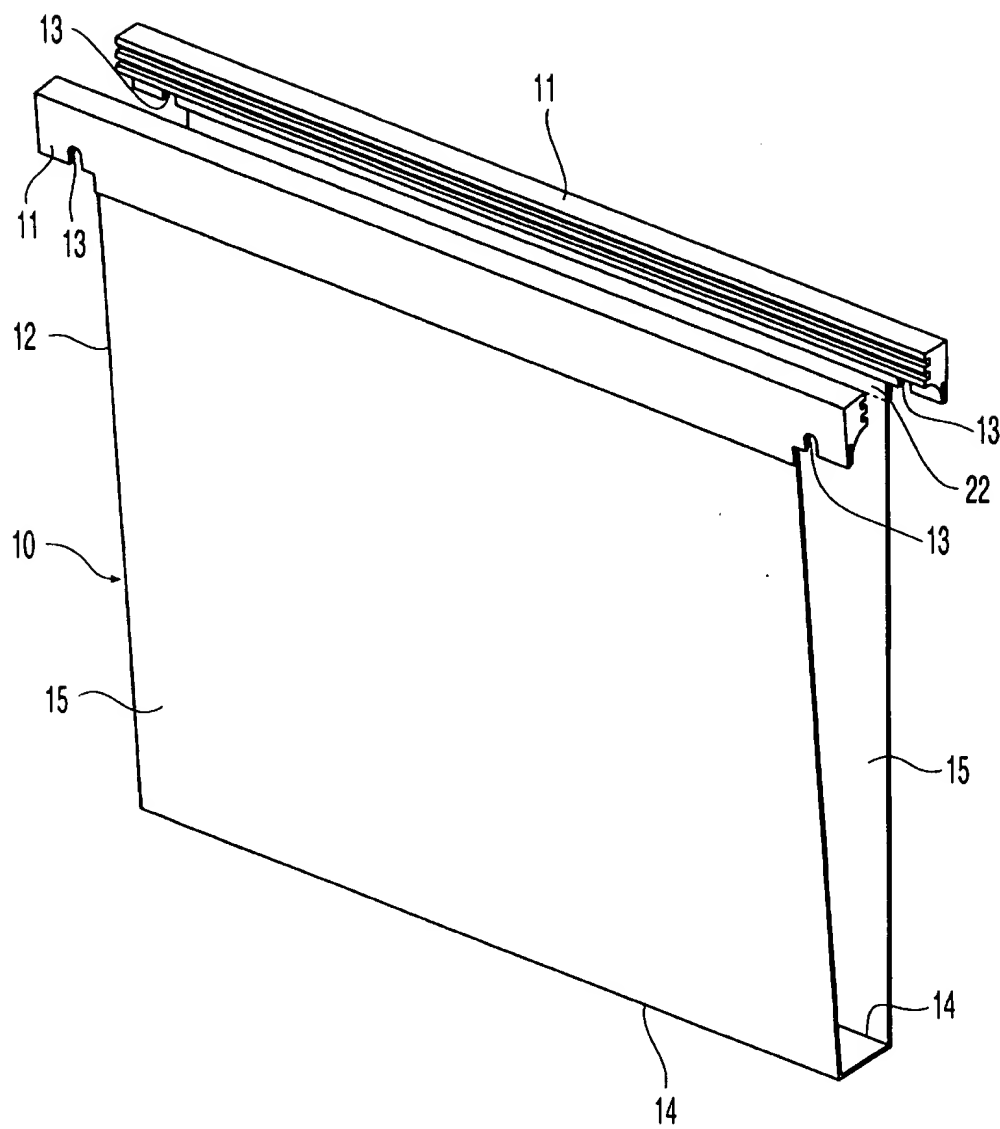
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Primary Examiner—Eugene Kim(74) *Attorney, Agent, or Firm*—Pennie & Edmonds LLP(57) **ABSTRACT**

A method for manufacturing a thermoplastic hanging file folder, and the folder formed by such method. A web of thermoplastic sheet material is provided, where the web has a width with first and second opposed side edge portions. In a separate step, at least one thermoplastic support bar profile extrusion is formed, wherein each support bar profile extrusion comprises a relatively thick upper portion tapering to a correspondingly thinner lower portion. An opposed side edge portion of the thermoplastic web is positioned over the thin portion of the thermoplastic support bar profile extrusion to form a region of contact. In a bonding step, the thermoplastic support bar profile extrusion or extrusions are bonded to corresponding edges of the thermoplastic sheet at the region(s) of contact. A predetermined length of the thermoplastic web, having the thermoplastic support bar profile or profiles bonded thereon, is then separated from a remaining portion of the web to form the hanging file folder.

30 Claims, 3 Drawing Sheets

*Fig. 1*

*Fig. 2*

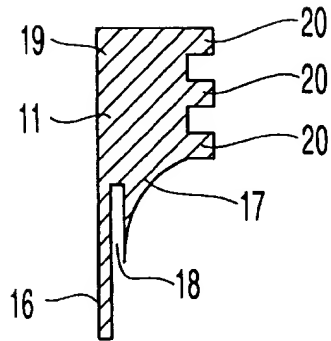


Fig. 3

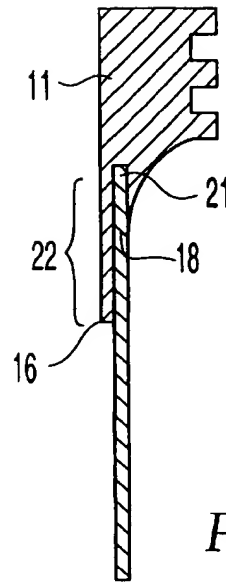


Fig. 4

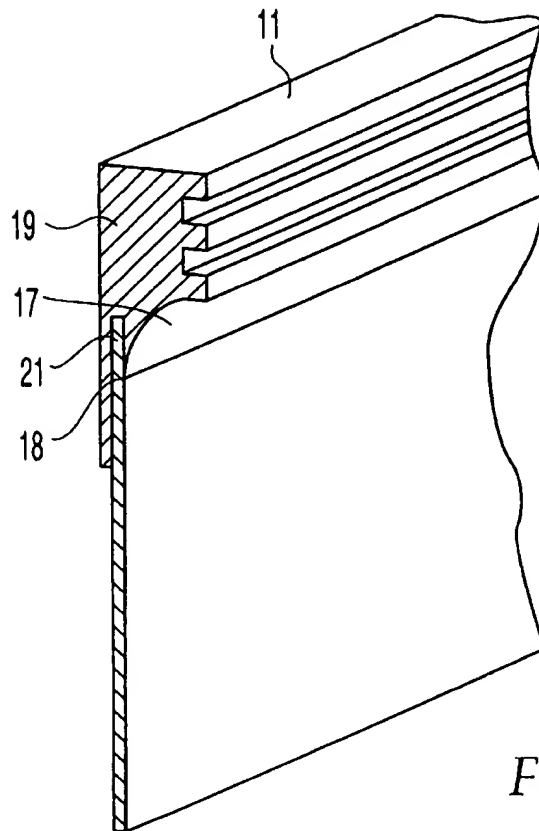


Fig. 5

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METHOD OF MAKING A HANGING FILE FOLDER AND THE FOLDER MADE THEREBY

FIELD OF THE INVENTION

The present invention relates to file folders, and in particular, to a method of making a hanging file folder formed of thermoplastic material and to the folder made by such method.

BACKGROUND OF THE INVENTION

File folders, and, in particular, hanging file folders, have long been used in standard storage units such as file cabinets, desk drawers, and the like, and are a necessary storage tool in modern offices and businesses. The typical folder is made of folded cardboard with metal support bars attached to the upper edges. The metal support bars have hooks or notches at their ends to enable the folder to hang on a complementary standard parallel file frame commonly provided in office storage equipment, such as the aforementioned file cabinets and desk drawers.

Such folders often are unable to stand up to the wear and tear to which they are subjected. The cardboard is susceptible to creasing and ripping, particularly where it contacts the support bars and/or along the center fold where the weight of inserted papers is concentrated. In addition, during heavy usage the metal support bars may bend out of shape, so that the folder can no longer be hooked onto the suspension rails. Manufacture of hanging file folders is also less efficient than it could be, due to the number of manufacturing steps needed to produce the cardboard folder and support bars and to attach the components to each other. Furthermore, it is difficult to recycle such a file folder, because of the need to remove the metal support bars from the cardboard prior to disposal.

One way to make a more durable file folder is to manufacture it from thermoplastic material. Thermoplastics such as polypropylene resins have been used in a variety of office products such as pocket folders and non-hanging file folders, which have advantages over cardboard folders such as durability and shape-retention. Thermoplastic folders are also easy to recycle.

In the manufacture of a hanging thermoplastic file folder, a thin thermoplastic sheet may be formed and folded to define a folder, and support bars, also formed of thermoplastic, may be positioned along the upper edges of the folder to add strength and rigidity, and to enable the folder to hang from suspension rails. One concern in forming such a folder is the method by which the relatively thick support bars are attached to the comparatively thin, upper edges of the folder. The desired result is a smooth, flat file folder with straight, fairly rigid bars along the upper edges. However, known methods for connecting a thick bar of plastic to a thin sheet of similar or like material often achieve less-than-satisfactory results.

Attaching or welding a thin sheet of plastic to a thick bar or strip is a technique practiced in a variety of technological fields. One such field involves the formation of plastic bags with zipper closures. U.S. Pat. No. 5,152,613 to Herrington (hereinafter "the '613 patent") discloses a "plastic film zipper bag having straightened heat seals", wherein a thin film of plastic is extruded and plastic zipper "fins" or elements are extruded in a separate operation. The plastic film, which forms the bag portion, is thereafter attached at its upper edges to the plastic fins of the zipper track. The plastic fins are thicker in cross-section than the thin film edges.

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Thus, when these components are heated and melted together, the thin film edges heat and melt more quickly than the fins, which act as a heat sink due to their much greater thickness. The unequal heating and melting of these components tend to cause the fin and film to shrink and pucker after they have been welded together and begin to cool down. The result is puckering and bending along the weld line. The '613 patent addresses this phenomenon by disclosing a method of stretching the seal line.

While welding together separate components with unequal cross-sections can lead to inadequate welds, certain other processes avoid such weld problems by forming the thick and thin sections together, i.e., as one piece. For example, in a process known as profile extrusion, the profile, or cross-section, of the part to be extruded contains both thick and thin sections. Typically, however, a profile design that contains both thick and thin sections is to be avoided, because the thicker section cools more slowly than the thin part of the profile upon exiting the profile extrusion die. As the profile cools, it shrinks somewhat. The relatively quick cooling and shrinking of the thin section, coupled with the slower cooling and shrinking of the thick section, can result in a profile whose shape is warped or distorted.

Also known in the prior art is a hanging, disk-storage pocket sold by the Esselte Corporation from 1983 to 1985. The disk-storage pocket was for storing 5.25-inch and 3.5-inch computer disks, and the transparent, PVC pocket could be hung on a support frame. The pocket has a single support bar that is high-frequency welded to a back upper edge of the pocket, and the front upper edge of the pocket is cut in a wide V shape to facilitate access to the inside of the pocket. To manufacture the disk-storage pocket, the support bar is extruded as a relatively stiff profile extrusion which is cut into individual support bars, and notches are cut into the bars near their terminal ends to enable the completed pocket to hang on a support frame. In a separate process, flat sheets of PVC are cut into appropriate shapes for the front and back walls of the pocket body. To assemble the pocket, a first flat sheet that is to form the back wall is aligned so that its upper edge overlaps an edge portion of the support bar. A second flat sheet, pre-cut to the shape of the pocket's front wall, is positioned on top of the first flat sheet. The first and second flat sheets are welded to each other at their side and bottom edges in order to form the pocket body, and the top edge of the first flat sheet is welded to the support bar to complete the pocket assembly.

The manufacturing process for making the disk-storage pocket thus requires a number of discrete steps, all of which add to the expense of producing the item. Furthermore, the completed pocket has exposed seam edges where the overlapping support bar and back wall edges are welded together. These exposed seam edges are capable of snagging computer disks or other items that are inserted into or pulled out of the pocket, and they create stress concentrations in the adjacent portions of the pocket walls when the pocket is pulled, twisted or bent. Such stress concentrations can lead to premature tearing, which is unsightly and shortens the useful life of the pocket.

In manufacturing a thermoplastic hanging file folder, which is to have thick support bars attached to the top edges of a thin, folded sheet, none of the processes described thus far optimizes the connection between the thin sheet and the thick bar. As described above, extruding thin and thick components separately and then welding them together causes a weld line that tends to pucker or bend. Furthermore, extruding thick and thin components together in a single piece or profile tends to cause warping or distortion. Such an

extrusion design is also particularly problematic in the manufacture of hanging file folders, because the extruded thermoplastic webbing used in forming the folder body passes between and around rollers at different stations in the machinery of the extrusion line. If the support bar were extruded together with the webbing, the thickness of the support bars would interfere with the rollers that guide and pull the sheet or web of thermoplastic through the machinery. Also described above is the process of welding together the edges of a relatively stiff bar and a comparatively bendable flat sheet of thermoplastic, with the result that exposed seams edges may cause snagging or tearing. In manufacturing processes that require the fabrication, cutting, alignment and welding of a number of separate pieces of thermoplastic material, the inefficiencies built into such processes increase the costs of the final product.

Thus, a need exists for a method of making a hanging file folder that is more durable than the typical paper folder known in the art; that can be made of thermoplastic, wherein the manufacturing process does not lead to puckering, warping, distortion, snagging or tearing at the connection between the support bars and the upper edges of the folder; and wherein the number of manufacturing steps is minimized so as to produce an inexpensive, strong, recyclable folder having support bars that are securely and smoothly attached to the folder edges.

SUMMARY OF THE INVENTION

The present invention is directed to a method of making a hanging file folder and to the file folder made thereby. According to a first, i.e., "continuous" embodiment of the method of the invention, in a first step a web or sheet of thermoplastic having first and second opposed side edges is formed. These edges thereafter become the upper edges of the file folder. In a second, separate step, at least one and preferably two thermoplastic support bar profile extrusions are formed in a profile extrusion process. The support bar profile extrusions, which are cut and attached to the web as explained below to form the folder support bars, are each produced in the shape of a long, continuous strand having a uniform cross-section. In the extrusion art, the extrusion shape is known as a "profile".

Preferably, the thermoplastic web or sheet and the support bar profile extrusions are formed from a polymeric material, of which the most preferred material is polypropylene. The support bar profile extrusions may if desired be made of polypropylene that is filled with a reinforcing agent to enhance stiffness and strength.

Each support bar profile extrusion has a relatively thick upper portion which is more or less rectangular in cross-section and which may include a plurality of ribs for improved strength and rigidity. The thick upper portion then narrows down to a correspondingly thinner lower portion. The lower portion is defined on its inner face by a tapered surface configured and adapted to form a smooth transitional surface at the interface between the support bar profile and the thermoplastic sheet to prevent bending and/or snagging of papers as they are placed into or removed from the folder. The other side of the lower portion will face the outside of the folder and is defined by a thin strip extending downwardly from the outer face of the upper portion, having a cross-sectional thickness approximately the same as the thickness of the thermoplastic sheet. In this context, words denoting the directions "up" and "down" refer to the orientation of components of the folder when it is hanging by its support bars in a file frame. Also, as used herein an "inner

face" is on the inside of the folder, while an "outer face" faces the outside of the folder.

In the next stage of file folder formation the web of thermoplastic sheet is guided so that at least one and preferably both its first and second opposed side edges are laid over the corresponding thinner lower portions of the first and second thermoplastic support bar profile extrusions. A first region of contact is formed between the first side edge of the thermoplastic sheet and the thinner lower portion of the first support bar profile extrusion, and a second region of contact is formed between the second side edge of the thermoplastic sheet and the thinner lower portion of the second support bar profile extrusion. At the first and second regions of contact, the thermoplastic support bar profile extrusions are bonded to the opposed side edges of the thermoplastic sheet, preferably by heat bonding, but alternately other bonding methods known in the art may be substituted.

For some applications, as noted above, it may be desirable to attach only one thermoplastic support bar profile along one corresponding web edge. In such a case, the opposite side portion of the folder, i.e., without a support bar, may be supported, e.g., by folding it upwardly toward the supported portion and bonding the two portions together along their lateral edges using, for example, an adhesive, heat bonding or other methods well known in the art.

After bonding is completed, the resultant composite is separated into desired lengths, each of which comprises, in the preferred embodiment, a folder body having two side edges and a width and two support bars attached to the two upper edges of the folder body. During the separation step, the web portion is cut such that the support bar(s) have terminal end portions that extend past the side edges of the web. The folder body may thereafter be scored at one or more fold lines across its width to produce a hanging file folder having two sides and two walls with upper edges that are attached to the support bars.

According to an alternate, i.e., "batch" method of the process of the invention, the thermoplastic web or sheet is formed and then cut to create an open file folder body having first and second upper edges and a width. Correspondingly, two thermoplastic support bar profile extrusions are separately formed, wherein each profile extrusion has, as described above, a cross section comprising a thick portion, a tapered portion and a thin edge portion. The support bar profile extrusions are independently cut into support bars that fit the upper edges of an open file folder body. The open file folder body is positioned such that its first and second upper edges overlap the thin edge portions of the first and second support bars so as to form a region of contact between each upper edge of the open file folder body and the thin edge portion of a support bar. The first and second upper edges of the open file folder body are then bonded to the support bars at each region of contact. To create at least one fold line, the open folder body may be scored across its width. When folded at the fold line, the hanging file folder has two sides and two walls having upper edges that are attached to the support bars.

As with the continuous process described above, moreover, in an alternative embodiment of the invention only one support bar is attached to one upper edge portion of the file folder body whereupon the walls of the folder are either connected at the sides or are otherwise configured to keep the folder walls in a more or less vertical orientation.

In either the continuous or the batch embodiment of the invention, notches may be cut into the support bars near their

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terminal ends to make it easier for the completed file folder to hang on a file frame.

A further embodiment of the method of the invention includes the step of forming the support bar profile with a slot in the lower portion of the profile. The slot extends upward, toward the upper portion.

Additionally, a printing step may be included so that the completed file folder has a message or logo printed thereon.

In a further embodiment, the invention is a hanging file folder comprised of a file folder body and, preferably, two support bars wherein each support bar has a relatively thick upper portion that tapers down to a lower edge having a thin strip. For convenience the portion of the support bar that tapers down to the lower edge is referred to herein as the tapered portion. A slot in the lower portion extends upward into the tapered portion toward the thicker upper portion. The file folder body has two upper edge portions. These upper edge portions are each inserted into the slot in the lower portion of a support bar, creating a region of contact where each upper edge overlaps the thin strip of a support bar. The upper edge portions of the file folder body are bonded to the thin strips of the support bars.

The above and other features and advantages of this invention and the manner of attaining them will become more apparent, and the invention itself will best be understood, from a study of the following description with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features of the present invention are disclosed in the accompanying drawings, wherein similar reference characters denote similar elements throughout the several views, and wherein:

FIG. 1 is a schematic block diagram setting forth a preferred embodiment of the method steps of the invention;

FIG. 2 is a perspective view of the completed folder assembly;

FIG. 3 is a cross-sectional view illustrating the preferred profile of the suspension portion of the folder;

FIG. 4 is a cross-sectional view illustrating the attachment between the thermoplastic web and the suspension portion of the folder; and

FIG. 5 is a partial cut-away view of the inside of the folder including the suspension portion.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a schematic block diagram of a preferred method of making a file folder according to the present invention. A first extrusion line produces two support bar profile extrusions that will be formed into support bars. A profile extrusion is a term used in the extrusion art to denote the product of a profile extrusion process, i.e., a continuous length of extruded material having a uniform cross section, or profile. A second extrusion line produces a sheet extrusion that will be formed into file folder bodies. The sheet extrusion is in the form of a web, which is a large, continuous roll of material having two opposed side edges.

The support bar profile extrusions and the sheet extrusion disclosed herein are preferably formed from a thermoplastic polymer such as polypropylene, ABS or nylon. Polypropylene is the most preferred material for the extrusion that will form the file folder body although other methods known in the art may be substituted if desired. To ensure that the

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folder's support bars have appropriate stiffness and strength to withstand heavy use, it is desirable to use polypropylene filled with glass or other reinforcing agents known in the art for forming the support bar profile extrusions.

Once formed, the thermoplastic web is rolled and cooled. Then it is unwound and combined with two support bar profile extrusions in a bonding operation. In the bonding operation, the opposed side edges of the thermoplastic sheet extrusion are guided so that they are aligned with and overlap the thin lower portions of the support bar profile extrusions. In the preferred embodiment the region of overlap is heated until the thermoplastic polymer melts, thus welding together the sheet edges and support bar edges. Because the thin portion or strip of the support bar is of similar thickness to the sheet edge, the two materials heat up at approximately the same rate and form a smooth, flat, strong bond wherein puckering is minimized and preferably is completely prevented.

Heating of the overlapping edges may be accomplished by using infrared heat; a hot air gun; heated bars, irons or contact rollers; or other means, known to those of ordinary skill in the art, that induce heat through the double thickness of the sheet edge and the support bar profile edge.

Once the overlapping edges are heated and thereby welded together, the heat-welded extrusion is then cut and scored at a cutting and scoring station, after the weld has cooled, into individual pieces that are shaped like opened file folders. Preferably the pieces are die-cut. At the cutting and scoring station, the folder body is also scored across its width to create at least one central horizontal fold line.

When cutting the heat-welded extrusion into individual folders, it is preferably cut so that the support bars extend past the side edges of the folder. Therefore, some of the thin thermoplastic web material is cut away and forms scrap. This scrap may be collected and conveyed back to an extruder for re-melting and reprocessing. Notches are also cut near the ends of the support bars to enable the file to hang on a file frame located in a drawer, cabinet, etc. Scoring is preferably accomplished by using a scoring roller with a rounded knife edge on one face of the thermoplastic web and an opposing roller with a groove in it, on the opposite face of the web, but alternative means known in the art may be employed to put one or more fold lines on the folder body. Additionally, the scoring station does not have to be combined with the cutting station, but may instead be located before or after the cutting step.

An optional printing step may also be included in the process of the invention to imprint words or marks on the folder through either a hot-stamp process or a cold embossing step. The printing step may occur before or after cutting and scoring, or the three operations may be combined at one station.

Optionally, instead of forming two support bar profile extrusions, the method of the invention may comprise the formation of only one support bar profile extrusion, which is bonded to one of the two opposed side edges of the thermoplastic sheet extrusion. A hanging file folder made therefrom would have one support bar that is bonded to one upper edge of the file folder body. The front and back walls of the file folder body may be connected at the sides, or other methods known in the art may be employed to keep the walls in a substantially vertical orientation when the folder is hanging in a hanging file folder frame.

The method described above and illustrated schematically in FIG. 1 is preferably a continuous, or in-line, operation. An alternative embodiment to the continuous method is the off-line finishing or off-line batch welding method, which

involves cutting the thermoplastic web and the support bar profile extrusions to size before welding the support bars to the web edges. In the off-line finishing embodiment, the sheet extrusion line produces the thermoplastic web, which is then cut into file folder bodies of an appropriate length. The profile extrusion line produces one or more support bar profile extrusions, which are then cut into bars with notches near each end. The folder bodies and support bars are then combined and fused together either in assembly line fashion, or on a turntable with multiple stations. The folders are scored and also may be imprinted, as described above for the continuous embodiment.

In one embodiment of either the continuous or batch method of making the hanging file folder, a step may be added wherein the support bar profile is formed with a slot in the thinner lower portion. The slot extends upward towards the thicker upper portion and provides for smooth, accurate positioning when the upper edge of the file folder body is laid over the thinner lower portion of the support bar or support bar profile.

The completed file folder assembly 10, illustrated in FIG. 2, features support bars 11 whose ends extend past the width of the file folder body 12. Notches 13 are formed near each end of support bar 11. The notches 13 are spaced so that they may be supported by a conventional rack or frame commonly available for suspending file folders. Although the illustration in FIG. 2 features two folds 14 for a folder that can accommodate thick files, the number of folds is not critical. Folder walls 15 extend upward from the folds.

FIG. 3 illustrates support bar profile extrusion 11 for the hanging file folder of the invention, wherein the bar 11 has a thin strip 16 along the other face of its bottom edge, a tapered inner face 17, a slot 18 that is defined on one side by the strip 16 and on the other by the tapered face 17, and a relatively thick portion 19 that has optional ribs 20 for strength and rigidity. Ribs 20 also enable tabs (not shown) to be hooked or otherwise secured to the top portion of the support bar for indexing purposes.

FIG. 4 illustrates a cross-section of support bar 11 with the upper edge 21 of a file folder wall 15 inserted into slot 18 and welded in place. Slot 18 enables the upper edge 21 to be banked so that accurate assembly is facilitated and so that edge 21 is hidden from view, resulting in a clean appearance and a reduced likelihood that the folder edge will catch or snag things or peel away from the support bar.

Support bar 11 and upper edge 21 of the file folder wall are bonded in region of contact 22 where thin strip 16 and upper edge 21 overlap. As described previously, an improved bond results when the two pieces to be welded together are of like or similar thickness. This improved bond is smooth, flat, strong and snag-resistant, and a folder made with such a bond has improved capability to withstand impact, bending, fraying, tearing and other forces and stresses to which hanging file folders are likely to be subjected.

FIG. 5 is a cut-away view of support bar 11 and the inside face 23 of file folder wall 15 with its upper edge 21 inserted into slot 18. The double thickness at region of contact 22 extends across the width of the folder wall 15, as illustrated on FIG. 2 at region of contact 22 above the dotted line. The double thickness gives the folder additional strength in a region that tends to experience high stress. In addition, FIG. 5 illustrates how the insertion of upper edge 21 into slot 18 hides the upper edge from view and allows tapered section 17 to form a smooth transition from the thick portion 19 of support bar 11 to the inside face 23 of the folder wall 15. This smooth transition helps to keep the edges of papers from being snagged as they are put into and removed from the file folder.

It should be understood that variations and modifications within the spirit and scope of the invention, beyond those

discussed herein, may occur to those skilled in the art to which the invention pertains. Accordingly, all expedient modifications readily attainable by one versed in the art from the disclosure set forth herein are to be included as further embodiments of the present invention. The scope of the present invention accordingly is to be defined as set forth in the appended claims.

What is claimed is:

1. A method for manufacturing a hanging file folder, comprising the steps of:

providing a web of thermoplastic material having a width with first and second opposed side edge portions;

providing at least one thermoplastic support bar profile extrusion having a thicker upper portion which tapers to a thinner lower web-contacting portion having a thickness which is about the same as that of the web of thermoplastic material;

providing the at least one thermoplastic support bar profile with a slot in the lower portion extending toward the upper portion;

guiding a side edge portion of the web over the thinner lower portion of the thermoplastic support bar profile extrusion and into the slot of said thermoplastic support bar profile extrusion such that a region of contact is formed between the edge portion of the web and the thinner lower portion of the thermoplastic support bar profile extrusion;

heat bonding the lower portion of the thermoplastic support bar profile extrusion to a corresponding edge of the web at said region of contact, wherein said lower portion and said thermoplastic web are heated at approximately the same rate to form a smooth, flat bond, thereby minimizing puckering; and

separating a predetermined length of the web having the at least one thermoplastic support bar profile bonded thereon from a remaining portion of said web to form said hanging file folder.

2. The method of claim 1, wherein the lower portion of the thermoplastic support bar profile extrusion provides a flat surface in said region of contact with the web, and further comprising bonding the entire flat surface on the lower portion of the thermoplastic support bar profile extrusion to the web at said region of contact.

3. The method of claim 1, comprising:

providing first and second thermoplastic support bar profile extrusions;

laying the first and second opposed side edge portions of the thermoplastic web over the lower portions of the first and second thermoplastic support bar profile extrusions to produce first and second regions of contact between the respective edge portions and the lower portions of the support bar profile extrusions; and

heat bonding the lower portions of said first and second support bar profile extrusions to said first and second opposed edge portions at said respective regions of contact.

4. The method of claim 1, wherein the lower portion of said thermoplastic support bar profile extrusion comprises, on an inner face, a tapered surface, and on an outer face a thin strip extending downwardly from the upper portion.

5. The method of claim 1, further comprising:

scoring at least one fold line across the width of the thermoplastic web; and

folding the file folder along said fold line.

6. The method of claim 3, wherein the thermoplastic support bar profile extrusions are heat welded to the first and second opposed side edges of the thermoplastic web at the respective first and second regions of contact.

7. The method of claim 1, wherein said predetermined length of thermoplastic web is die-cut from a web of extruded thermoplastic.

8. The method of claim 1, which further comprises providing at least one rib in each said thermoplastic support bar profile extrusion to enhance the strength and rigidity of each said thermoplastic support bar.

9. The method of claim 1, which further comprises forming a notch adjacent a first and a second end of each said support bar, each said notch configured and adapted for supporting said folder upon a file frame.

10. The method of claim 1, which further comprises forming said thermoplastic web and the thermoplastic support bar profiles out of polypropylene.

11. The method of claim 1, which further comprises forming the thermoplastic support bar profiles from polypropylene filled with a reinforcing agent.

12. The method of claim 1, which further comprises providing a printed message on an outer surface of the hanging file folder.

13. The method of claim 1, further comprising:

providing a further thermoplastic support bar profile extrusion having a thicker upper portion which tapers to a thinner lower portion;

providing the further thermoplastic support bar profile with a slot in the lower portion extending toward the upper portion;

guiding a further side edge portion of the web over the thinner lower portion of the further thermoplastic support bar profile extrusion and into the slot of said further thermoplastic support bar profile extrusion such that a region of contact is formed between the further edge portion of the web and the thinner lower portion of the further thermoplastic support bar profile extrusion; and

heat bonding the lower portion of the further thermoplastic support bar profile extrusion to the further edge portion of the web at said region of contact, wherein said lower portion and said thermoplastic web are heated at approximately the same rate to form a smooth, flat bond, thereby minimizing puckering.

14. The method of claim 13, wherein the lower portion of each thermoplastic support bar profile extrusion comprises a tapered surface on an inner face, and further comprising scoring at least one fold line across the width of the thermoplastic web and folding the file folder along said fold line.

15. The method of claim 14, wherein the thermoplastic support bar profile extrusions are heat welded to the side edges of the thermoplastic web at the respective regions of contact.

16. The method of claim 13, which further comprises providing one or a plurality of ribs in each thermoplastic support bar.

17. The method of claim 13, which further comprises forming a notch near a first and a second terminal end of said support bars, said notches configured and adapted for supporting said folder upon a file frame.

18. The method of claim 13, which further comprises forming the thermoplastic sheet and the thermoplastic support bar profile extrusions out of polypropylene.

19. The method of claim 13, which further comprises using polypropylene filled with a reinforcing agent to form the thermoplastic support bar profile extrusions.

20. The method of claim 13, which further comprises imprinting a printed message on the hanging file folder.

21. The method of claim 1, wherein the lower portion of said thermoplastic support bar profile extrusion comprises, on an inner face, a tapered surface such that when the web is attached to the support bar the inside forms a smooth transition with no edges which may snag a paper that is placed into or removed from the file folder.

22. The method of claim 1, wherein the lower portion of at least one of said thermoplastic support bar profiles comprises, on an inner face, a tapered surface such that when the web is attached to the support bar the inside forms a smooth transition with no edges which may snag a paper that is placed into or removed from the file folder.

23. A method for manufacturing a hanging file folder, comprising the steps of:

forming a web of thermoplastic sheet material;

cutting the thermoplastic web to form a file folder body having first and second upper edges and a width;

providing first and second thermoplastic support bar profile having first and second support bars, each of which has two terminal ends, a thicker upper support portion, and a thinner lower web-contacting portion defined on one side, by a tapered surface on an inner face of said lower portion and, on the other side, by a strip having a thickness which is about the same as that of the web of thermoplastic material extending downwardly from an outer face of the upper portion with a slot formed between the tapered surface and strip;

positioning the file folder body such that its first upper edge engages the slot and overlaps the lower portion of the first support bar so as to form a first region of contact between the first edge of the open file folder body and the strip of the first support bar;

positioning the file folder body such that its second upper edge engages the slot and overlaps the lower portion of the second support bar so as to form a second region of contact between the second edge of the open file folder body and the strip of the second support bar;

heat bonding the first and second support bars to the first and second upper edges of the file folder body at, respectively, the first and second regions of contact, wherein said lower portion and said thermoplastic web are heated at approximately the same rate to form a smooth, flat bond, thereby minimizing puckering; and scoring at least one fold line that extends across the width of the file folder body and folding the file folder body along said fold line, so that the hanging file folder has two sides and two walls having upper edges that are attached to the support bars.

24. The method of claim 23, wherein the first region of contact is between the first edge of the open file folder body and a surface on the strip of the first support bar, and wherein the second region of contact is between the second edge of the open file folder body and a surface on the strip of the second support bar.

25. The method of claim 23, which further comprises heat-welding the first and second thermoplastic support bars to the first and second upper edges of the open file folder body at the first and second regions of contact.

26. The method of claim 23, which further comprises providing a plurality of ribs in each thermoplastic support bar.

27. The method of claim 23, which further comprises forming a notch near a first and a second terminal end of said support bars, said notches configured and adapted for supporting said folder upon a file frame.

28. The method of claim 23, which further comprises forming the thermoplastic sheet and the thermoplastic support bar profile extrusions out of polypropylene.

29. The method of claim 23, which further comprises using polypropylene filled with a reinforcing agent to form the thermoplastic support bar profile extrusions.

30. The method of claim 23, which further comprises imprinting a printed message on the hanging file folder.

* * * * *



US005783012A

United States Patent [19]

Porchia et al.

[11] Patent Number: **5,783,012**[45] Date of Patent: **Jul. 21, 1998**[54] **ADHESIVE CLOSURE HAVING ENHANCED BURST STRENGTH FOR FLEXIBLE BAG**[75] Inventors: **Jose Porchia, Midland; Brian C. Dais, Sanford, both of Mich.**[73] Assignee: **DowBrands L.P., Indianapolis, Ind.**[21] Appl. No.: **455,121**[22] Filed: **May 31, 1995**

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Related U.S. Application Data

[62] Division of Ser. No. 228,794, Apr. 15, 1994, Pat. No. 5,487,653.

[51] Int. Cl.⁶ **B31B 1/90**[52] U.S. Cl. **156/66; 493/214; 493/215; 493/264; 383/211**[58] Field of Search **156/66; 383/63; 383/65; 35; 211; 493/214; 215; 221; 264**[56] **References Cited****U.S. PATENT DOCUMENTS**

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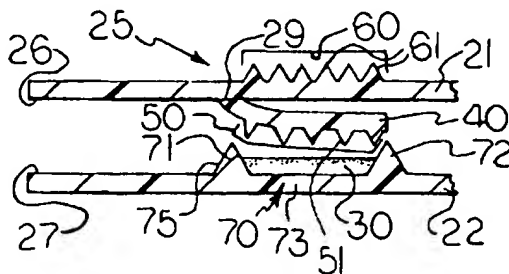
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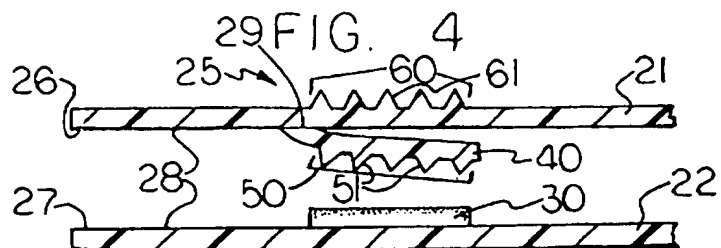
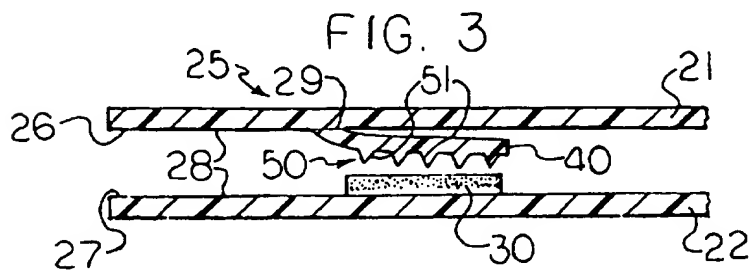
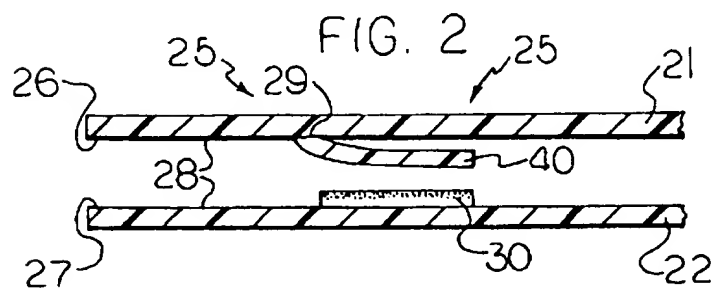
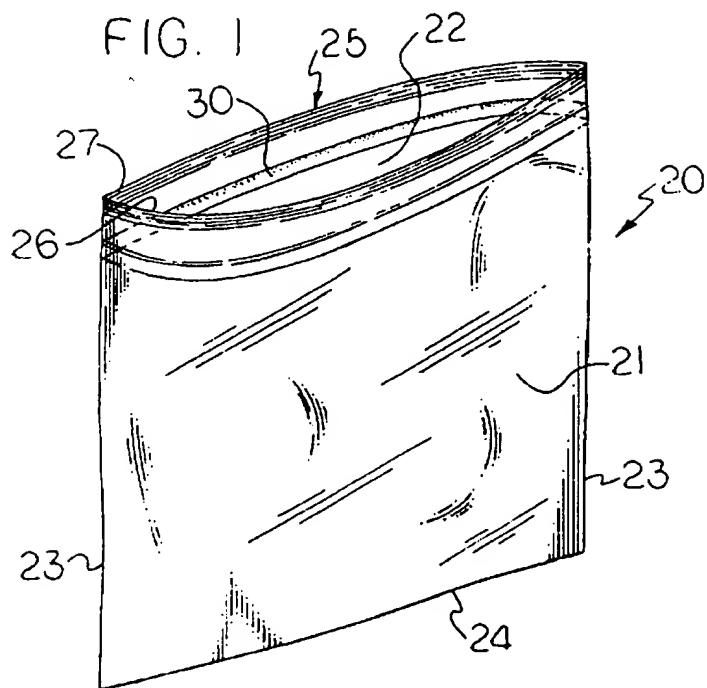
Primary Examiner—Daniel J. Stemmer[57] **ABSTRACT**

A resealable flexible thermoplastic bag including a front wall and a back wall, said walls being joined along the major portions of their opposite longitudinal edges and bottom; an open mouth adjacent to the top edge of said bag; a closure near the open mouth of said bag including an adhesive strip affixed to a first inner surface of one of a front wall or rear wall of a bag at a preselected distance from the opening of the bag; and a flap member strip affixed to a second inner surface of one of a front wall or rear wall of a bag at a preselected distance from the opening of the bag; said flap member of said bag being pressable against and into said adhesive strip on said first inner surface, whereby a seal is formed by contacting said adhesive strip with said flap member of said second inner surface.

8 Claims, 4 Drawing Sheets

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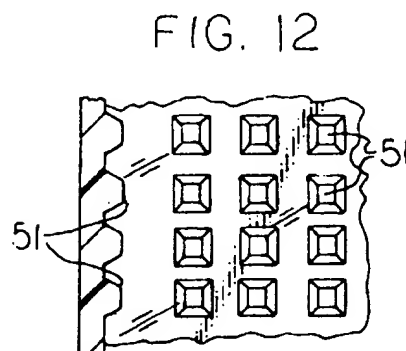
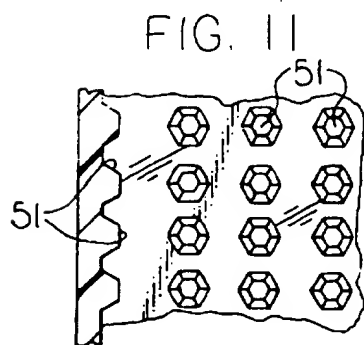
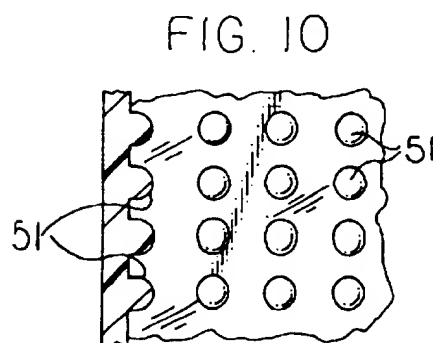
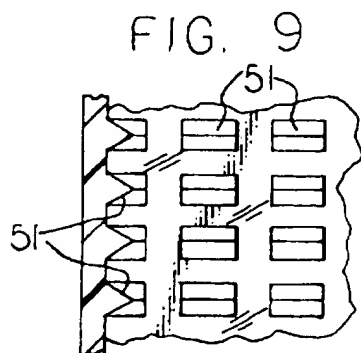
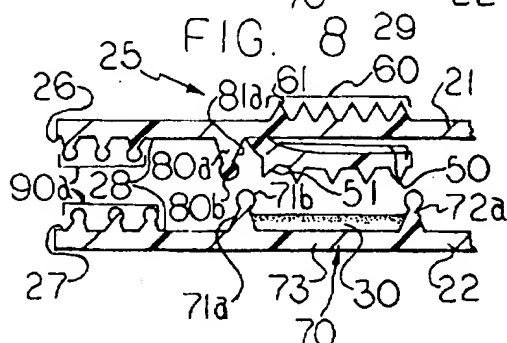
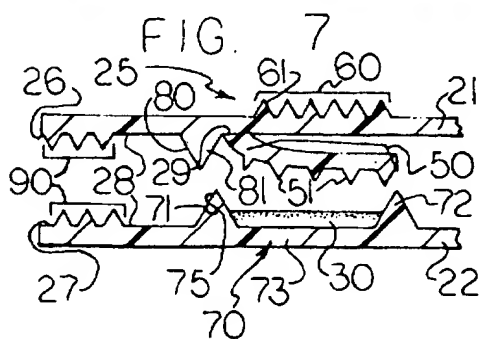
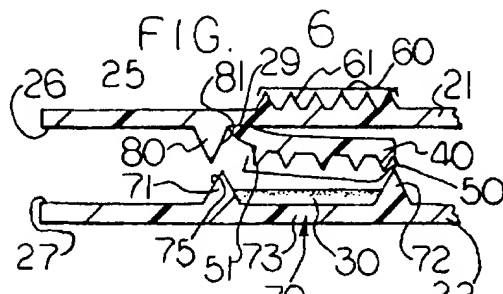
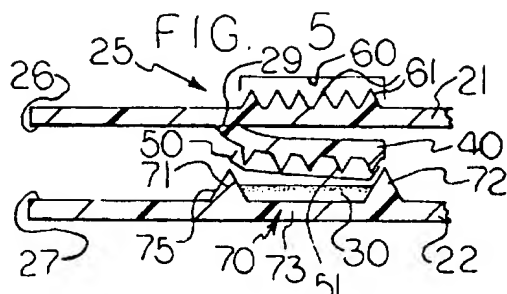


FIG. 13

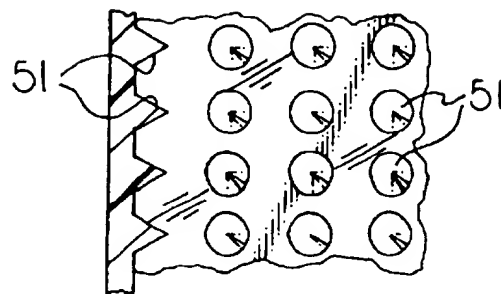


FIG. 14

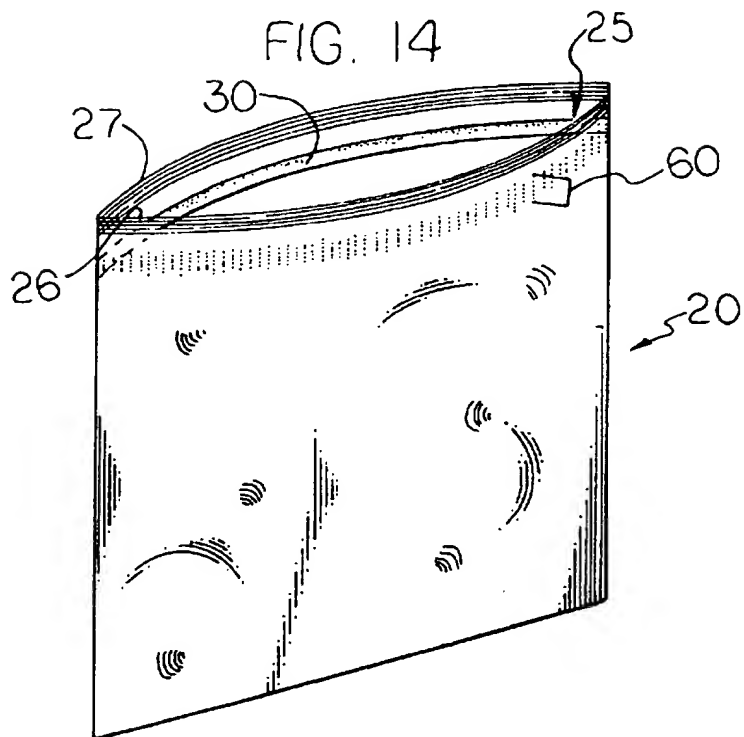


FIG. 15

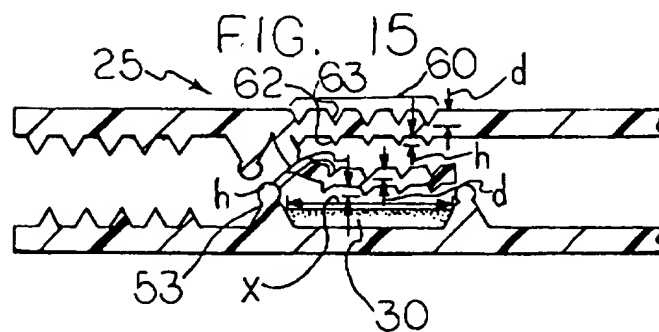


FIG. 16

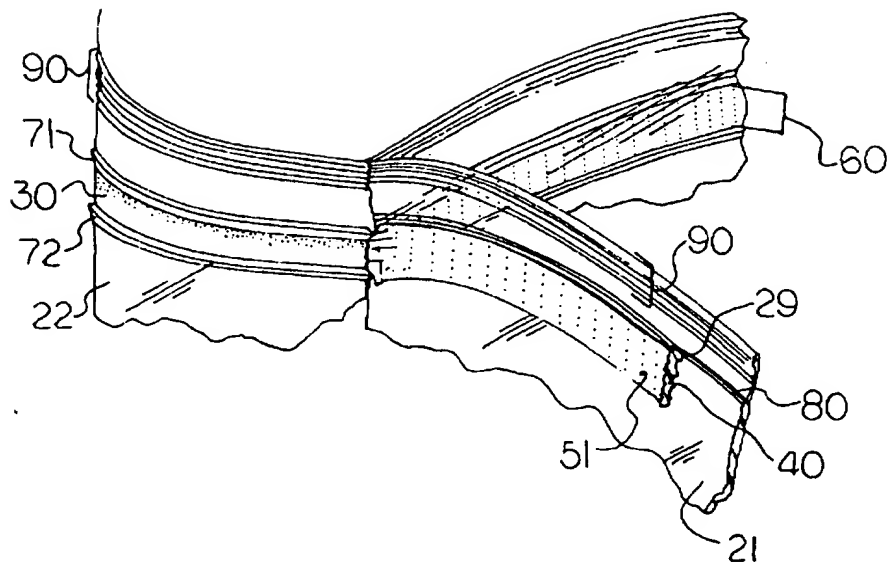


FIG. 17

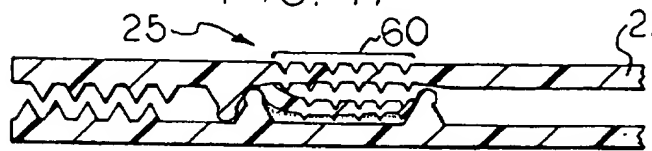
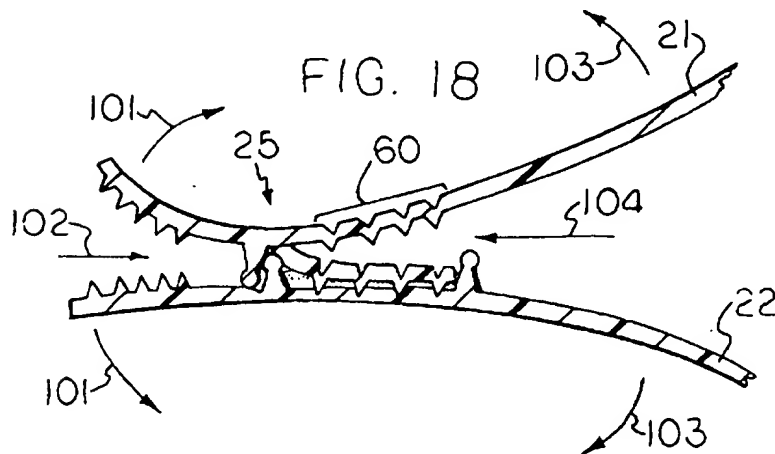


FIG. 18



ADHESIVE CLOSURE HAVING ENHANCED BURST STRENGTH FOR FLEXIBLE BAG

This is a divisional of application Ser. No. 08/228,794 filed Apr. 15, 1994, now U.S. Pat. No. 5,487,653.

BACKGROUND OF THE INVENTION

This invention relates to a closure for a thermoplastic bag and more specifically, this invention relates to an adhesive closure arrangement for a flexible thermoplastic bag.

Adhesive type closure arrangements have been used to seal and/or close plastic bags such as those used for sandwiches, garbage containers, and other household uses. For example, U.S. Pat. No. 4,519,095 describes an adhesive channel closure suitable for use with flexible bags, such as thermoplastic bags, especially those made from polyethylene, wherein the closure comprises at least one female channel member or strip-affixed to the bag and having a pressure sensitive adhesive layer on an internal portion of the channel strip such that the thickness of the adhesive layer is less than the interior depth of the walls of the channel strip. During shipment and storage the walls of the channel hold the pressure sensitive adhesive layer away from adjacent surfaces to prevent inadvertent sticking. Sealing of the bag is achieved by contacting the channel strip with a surface of the bag and exerting pressure along the strip whereby the pressure sensitive adhesive is contacted with a substantially flat portion of the surface and adhered thereto.

U.S. Pat. No. 4,519,095 shows a channel with the adhesive layer positioned on a flap of the bag; a channel with the adhesive positioned on the body of the bag over which the flap will fold; and two female channel strips positioned on opposite sides of a bag opening to affect a double seal by pressing the two channels into contact such that one wall or bead of each channel is contacted by the adhesive layer in the opposing channel.

One problem with the adhesive closures having rigid channel strip ribs described in U.S. Pat. No. 4,519,095 is that the closures are not easy to close. A sufficient amount of pressure applied to the rigid channel strip ribs is required to overcome the rigidity of the ribs to effectuate a closure. In addition, the closure requires restricting the width between the ribs to a predetermined width in order to avoid premature contact of the pressure sensitive adhesive with the opposite contact surface wall during processing and shipping of the bag, i.e., to avoid premature closure. The channels are also too small to accommodate the thumb of a user. Also, there is less surface contact between wall and adhesive because of the height and width of the channel. In addition, the bag surface adjacent the adhesive wrinkles easy causing an inadequate closure and leakage of liquids through the closure. Furthermore, there is no tactile indication on the closure described in U.S. Pat. No. 4,519,095.

Another problem with the closure described in U.S. Pat. No. 4,519,095 is that the external opening force is the same as the internal opening force of the closure. Thus, the contents of the bag will tend to fall out of the bag since the closure is easily opened from the inside and the closure does not have sufficient closure force to hold the contents in the bag when the bag is placed upside down or horizontally where pressure is exerted against the closure by the contents. On the other hand, if the adhesive is made strong enough to hold the contents, then the bag will be difficult to open.

It is desired to avoid the problems with the prior art closures and provide closures suitable for use with plastic

bags wherein the closures are able to effect a satisfactory seal as needed.

It is also desired to provide a flexible bag with an easy external openable and resealable closure and yet have a stronger internal sealing force to prevent the opening of the bag from the inside due to the pressure of the contents when the bag is undesirably placed in a non-upright position.

SUMMARY OF THE INVENTION

One aspect of the present invention is directed to an adhesive closure useful for a flexible thermoplastic bag including:

an adhesive strip affixed transversely across the longitudinal width of a first inner surface of one of a front wall or rear wall of a bag at a preselected distance from the opening of the bag; and

a flap member strip affixed transversely across the longitudinal width of a second inner surface of one of a front wall or rear wall of the bag, and aligned on the wall opposite from the adhesive strip on the first inner surface, at a preselected distance from the opening of the bag;

said flap member of said bag being pressable against and into said adhesive strip on said first inner surface, whereby a seal is formed by contacting said adhesive strip with said flap member of said second inner surface, providing an enhanced burst strength to the internal opening of the bag.

Another aspect of the present invention is directed to a resealable flexible thermoplastic bag including a front wall and a back wall, said walls being joined along the major portions of their opposite longitudinal edges and bottom; an open mouth adjacent to the top edge of said bag; and the aforementioned adhesive closure near the open mouth of said bag.

In one embodiment of the closure of the present invention, a female channel strip is affixed to a surface of one of said front wall or said back wall at a preselected distance from said opening; and a flap member is affixed to the other of said front or back wall opposite of the female channel; said channel strip having a trough between two channel ribs; and an adhesive layer in said trough, such that the flap member portion of said bag is pressable into said trough between said channel ribs, whereby a seal is formed by contacting said adhesive layer with said flap member portion of said second surface.

In another embodiment of the closure of the present invention, a self-alignment guidance rib member is positioned adjacent the flap member surface on the opposite wall from the channel strip and which contacts one of the channel rib members.

In still another embodiment, a tactile surface is provided on the outer surface of the wall on which the flap member portion is attached.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a thermoplastic bag having one embodiment of a closure constructed in accordance with the present invention.

FIG. 2 is an enlarged cross-sectional view of one embodiment of the closure of the present invention.

FIGS. 3 to 8 are enlarged cross-sectional views of various embodiments of the closure of the present invention.

FIGS. 9 to 13 are partly cross-sectional and partly front view of various embodiments of the roughened surface portion of the closure of the present invention.

FIG. 14 is an elevational view of a thermoplastic bag having another embodiment of a closure constructed in accordance with the present invention.

FIG. 15 is an enlarged cross-sectional view of another embodiment of the closure of the present invention.

FIG. 16 is a portion of the bag of FIG. 15 showing the closure portion partly opened and partly closed.

FIG. 17 is an enlarged cross-sectional view of the closure shown in FIG. 16 in a closed position.

FIG. 18 is an enlarged cross-section view of the closure shown in FIG. 17 in a closed position and showing the opening and closure forces therein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a thermoplastic bag having a closure constructed in accordance with the present invention. A bag or bag body 20 comprises a front wall 21 overlying a back wall 22. Front wall 21 is attached to back wall 22 along opposite longitudinal heat seal edges 23 and bottom fold line 24, thereby forming an open mouth adjacent to the top edge of the bag. The open mouth provides access to the interior of the bag. The bag is preferably made out of a plastic film such as polyethylene. Adjacent the top edge opening of the bag 20 is positioned a closure arrangement generally indicated as numeral 25, the various embodiments shown in more detail in FIGS. 2 to 8.

With reference to FIG. 2, and in its broadest scope, the closure arrangement 25 is made up of an adhesive member 30 mounted on and positioned on the inside surface of one wall, for example the back wall 22, and a flap member 40 mounted on and positioned on the inside surface of one wall, for example the front wall 21 which is opposite of the adhesive strip 30. The adhesive member and flap member are provided in the form of strips that extend transversely across the full longitudinal width of the opening and are mounted to the bag generally near respectively longitudinal edges 26 and 27 closest to the opening of the bag. The flap member 40 is attached to the wall 21 at point 29 along one edge of the flap member. A surface space 28 between the upper edges 26 and 27 and closure members on walls 21 and 22 provide for gripping by a user.

Closure of the bag 20 is effected by contacting the front wall 21 to the back wall 22 and applying pressure along the area where adhesive strip 30 is contacted with the front wall member 21 thereby contacting the adhesive 30 with the flap member 40 of front member 21. Thus, the adhesive strip and flap member mesh together and join the front wall 21 to the back wall 22 of the bag to enclose the opening of the bag. It is one of the features of the present invention that the bag may be easily closed by contacting at least a portion of the flap member across the width of the bag without the closure strips being precisely aligned. During use, the adhesive and flap member are pressed together and secured together to join the front wall 21 to the back wall 22 and enclose the opening. When desired to open the bag, the front wall and the back wall may be grasped at the gripping surface 28 and pulled apart. The closure may be pressed and pulled apart many times to easily open (and reopen) and close the bag opening. The flap member 40 provides a means for enhancing the burst strength of the bag as described below.

The adhesive 30 of the present invention may be made of, for example, pressure-sensitive adhesive material or contact adhesive material. Preferably, the closures of the present invention are useful with adhesive systems such as pressure-sensitive adhesive materials including acrylic, natural and

synthetic rubber types. Adhesives having good peel strength are also preferred.

With reference to FIG. 3, there is shown another embodiment of the closure of the present invention including a first inside roughened surface 50 on the flap member 40 inside surface which is to contact the adhesive strip 30.

The inside roughened surface portion 50 of the flap member 40 of the front wall 21 in contact with adhesive 30 is preferably roughened to advantageously provide a means for substantially preventing wrinkling of the contact surface upon closing of the bag. The roughened surface 50 also provides more surface area for adhesive contact and, thus, greater adhesion. The roughened surface 40 can be any type of surface to provide a wrinkle-free closure, for example, a uniform outwardly facing structured surface such as vertical or horizontal ridges or an embossing pattern.

In FIGS. 9 to 13 there is shown various embodiments of a plurality of protuberances 51 of various shapes which can be used as the roughened surface 50. For example, the protuberances 51 used in the present invention may be triangular in shape (FIG. 9), spherical in shape (FIG. 10), honey-combed in shape (FIG. 11), pyramidal in shape (FIG. 12), or conical in shape (FIG. 13). Other protuberances useful in the present invention and their manufacture are described in U.S. Pat. No. 5,113,555 incorporated herein by reference.

Generally, the roughened surface 50 may be extruded or embossed. More particularly, the roughened surface may be extruded as an integral portion of the bag itself, or embossed directly on the surfaces of the bag, rather than constructed as a separate member that is mounted on the bag.

In an optional embodiment, the roughened surface area 50 may contain a layer or coating of another adhesive (not shown) such as an adhesive of the same material or of different material than the adhesive 30 for contact adhesion provided that the other second adhesive adheres only to the adhesive 30. The second adhesive would readily attach to and detach from the adhesive 30 to provide the resealable feature of the present invention.

With reference to FIG. 4, there is shown another embodiment of the closure of the present invention including a second roughened outer surface 60 located on the outer surface of wall member 21 opposite the flap member 40 and the first roughened surface 50. The outer roughened contact surface 60 is used as a contact surface for contacting with a thumb or finger to provide tactility to a user.

The outside roughened surface portion 60 to be contacted with a thumb or finger by a user upon closing the bag is preferably roughened to advantageously provide a means for tactility when closing the bag. The roughened surface 60 can be any type of surface to provide tactility, for example, ridges or an embossing pattern with protuberances 61. The roughened surface 60 can be of the same type of surface as described with reference to roughened surface 50 for example, the embossing patterns with protuberances 51 shown in FIGS. 9 to 13. Examples of other types of outer roughened surfaces for the closure members which can be used in the present invention are described in U.S. Pat. No. 4,479,247; and in Canadian Patent No. 2,018,390 both which are incorporated herein by reference.

In a preferred embodiment, the inner and outer roughened surfaces, 50 and 60, respectively, are created substantially simultaneously in one step by impressing or embossing the outside surface of wall 21 with sufficient pressure using for example a pressure roller with conical protuberances to create a plurality of protuberances 62 on the inside surface

5

of wall 21 and a series of indentions or recesses 63 on the outside surface of wall 21 which transfer through the thickness of the wall 21 to form protuberances 52 on the inside surface of flap member 50 and a series of indentions or recesses 53 on the outside surface of flap member 50 as shown in FIG. 15.

Generally, the depth "d" of the recess 53 or 63 is up to about the thickness of the film and the height "h" of the protuberance 52 or 62 is from a ratio of "h/d" of about 1.1 to about 1.9. The spacing "s" between protuberances 52 or 62 is from about $\frac{1}{16}$ inch to about $\frac{1}{4}$ inch. A sufficient surface portion of the front wall 21 is embossed to cover substantially the entire distance "x" of the adhesive strip 30. The embossing pattern can be formed by any conventional roller means having protuberances of the desired shape.

With reference to FIG. 5, there is shown a more preferred embodiment of closure 25 of the present invention including a female channel strip 70 positioned on the inside surface of one wall, for example the back wall 22, at a preselected distance from the opening. The adhesive 30 is positioned inside the channel strip 70.

The channel strip 70 has walls or ribs 71 and 72 and a base 73 which comprise a trough. Rib 71 will herein be referred to as upper rib 71 because it is nearest the top edge opening of the bag 20 and rib 72 will herein be referred to as lower rib 72 because it is below rib 71 relative to the top edge opening of the bag, when the bag is in an upright position as shown in FIG. 1. Preferably, base 73 is a layer formed integrally with ribs 71 and 72. Channel 70 may be fabricated in a separate step and applied to the wall 22 or it may be formed as an integral part of wall 22, e.g., by a heat deformation process such as well known post-applied extrusion or lamination processes. Interior to channel 70 is a layer of pressure sensitive adhesive 30, uniformly layered between the ribs 71 or 72 of channel 70 and which should preferably be applied to the bottom or base portion 73 of channel 70. Preferably the adhesive layer 30 is continuous or uninterrupted. The adhesive 30 may be applied as a hot melt, coating or any of a number of conventional adhesive application methods.

Closure of the bag 20 is effected by contacting the front wall 21 to the back wall 22 and applying pressure along the area where channel strip 70 is contacted with front wall member 21 thereby contacting the adhesive 30 with the flap member 40 of front wall member 21.

With reference to FIG. 6, there is shown an even more preferred embodiment wherein the front wall 21 of the bag 20 preferably contains a self-aligning and guidance means for the closure 25, in this instance, an aligning or guidance rib member 80 located adjacent the flap member 40 for contacting the channel strip 70. The rib 80 is on the inside surface of front wall 21 opposite the rib member 71 and off set slightly from rib 71, just above the upper rib 71, to provide a mating surface 81 with the surface 75 of rib 71. The guidance rib 80 provides a tactile guide for the thumb or finger of a user as the thumb or finger travels on the surface 60 and the front wall 21 is pressed against the back wall 22 for closure. The guidance rib 80 also provides a guide to align the flap member 40 of the front wall 21 for contacting with the channel 70.

In an optional embodiment the front and/or rear walls 21 and 22, respectively, at near the upper edges 26 and 27, respectively, on the gripping surface 28 can contain "grip strips" or gripping surfaces made up of ribs 90 as described in U.S. Pat. Nos. 5,009,828 and 5,167,454 incorporated herein by reference. In the alternative, the gripping surface 90 may be a roughened surface or embossed surface as described in European Patent No. 0 089 680, incorporated herein by reference.

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FIG. 8 shows an enlarged cross-section views of an embodiment of closure 25 constructed in accordance with this invention in which the rib members 71a and 72a, the alignment rib member 80a, and the grip strips 90 have a key-hole type shape as described in U.S. Pat. Nos. 5,167,454 and 5,192,135, incorporated herein by reference. Any of one of the rib members, guidance rib or grip strips alone, or in combination with each other, may be key-hole shaped. In the alternate embodiment shown in FIG. 8, the guidance rib 80a with bulbous head 80b advantageously slides off the bulbous head 71b of rib 71a for ease of closure.

Any of the rib members 71 and 72 or guidance member 80 may be formed by extruding two extruded beads or ribs 71 and 72 onto a film web member to form a channel strip 70. The channel strip 70 of such an embodiment would have a base 73 comprising a portion of the film surface between the two beads 71 and 72, and a layer of adhesive 30 would be positioned on the surface within the area defined by the beads 71 and 72.

In FIGS. 14 to 18, there is shown a most preferred embodiment of the present invention wherein the guidance rib member 80 and the rib member 71 and 72 of the closure 25 includes a bulbous portion as shown in FIG. 15.

As shown in FIG. 16, as the bag is closed by pressing the front wall 21 against the back wall 22 at the channel 70 and embossed surface area 60, the guidance rib 80 rides on rib 71 while the flap member 40 is contacted with adhesive 30.

FIG. 17 shows a sectional view of an enlarged cross-section of the closure 25 of the present invention in a sealed position in which female channel strip 70 with adhesive layer 30 on an internal portion of the channel strip 70 in the trough, is positioned against the flap member 40 contacted with the adhesive layer 30 contained in channel strip 70 and has been pressed into the trough of the channel and into intimate contact with the adhesive layer, thus effecting sealing of the closure 25. The portion of flap member 40 of the front wall 21 that is contacted with adhesive layer 30 is deformed as may be seen in FIG. 17 to provide a seal.

FIG. 18 shows the forces acting on the closure 25. Opening of the bag from the outside shown by arrows 101 is by a peel force shown by arrow 102 while opening of the bag from the inside shown by arrows 103 is by a shear force shown by arrow 104. The maximum adhesion strength of the adhesive is when a shear force is applied to the adhesive strip 30. Thus, the opening force is small when compared to the burst force.

The amount of adhesive 30 contained in the channel structure 70 between the ribs 71 and 72 of channel structure 70 may be varied as desired. Generally, the amount of adhesive used or the thickness of the adhesive layer is up to a height sufficient to provide a uniform deformable surface to accommodate the height of the protuberances and to maintain contact with the surface area of the film wall at the base of the protuberances and the area between the protuberances to obtain the desired adhesion. The layer of adhesive 30 may be coated into channel structure 70 either as a continuous layer or as an interrupted layer, but is preferably applied at the bottom or base 73 as a continuous layer.

The dimension of ribs 71 and 72, including height and width, are selected such that each rib can be about 50 times thicker than the thickness of the film. The spacing between the ribs is selected to fit an average size thumb comfortably. A variety of dimensions may be used for the exterior height "r" and thickness "t" of channel ribs 71 and 72, interior width "w" of channel structure 70, and thickness "a" of adhesive layer 30. In a particularly preferred embodiment an extruded strip comprising polyethylene is applied to a polyethylene bag surface by means of a hot melt technique. A ribbon of pressure sensitive adhesive is positioned between

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the walls or ribs of the strip. The channel or ribbon structure is constructed so that the height "r" of the ribs 71 and 72 of the channel is from about 50 mils to about 70 mils high and the distance "w" between channel ribs 71 and 72 is from about 1/8 inch to about 1/4 inch apart. The thickness "t" of each channel ribs 71 and 72 is constructed to be from about 10 mils to about 50 mils, the thickness of a pressure sensitive adhesive layer 30 is a coating from about less than 2 mils or a height to provide a uniform deformable surface, and the layer of polyethylene is from about 0.5 mil to about 4 mils thick.

Pluralities of the closures of the present invention may also be used so that a bag may have two or more closure structures.

The channel strip 70 may optionally be colored in order to more easily locate their position on the bag. In another embodiment, the adhesive and/or the flap member surface may also be colored with different colors initially which change into a third color upon closing to provide for closure indication. For example, the adhesive may be yellow and the flap member surface may be blue to make green upon attaching the two closure members together; or other color combinations to make a third color can be used.

In another embodiment useful for closure indication, the closure members may be uncolored initially and upon closing form a color to provide closure indication. For example, when the closure members are made from polarized film such that when the closure members are superimposed upon each other, the closed or contacted closure changes to a certain color such as from clear to dark.

In still another embodiment, the closure members may be colored at certain intermittent or interrupted portions to form a series of uncolored spaces between colored portions of the closure member to form a "dashed" line along the closure strip. The dashed lines are offset such that when the two dashed lines are contacted, the uncolored spaces and colored portions of the closure members interdigitate and mesh together to form a single solid line of a particular color to provide an indication to the user that the bag is closed.

In carrying out the process of manufacturing the thermoplastic bags containing the closure of the present invention, a film web is formed, for example, by an extrusion process. The flap member 40 may be extruded separately and then post applied to the film web or extruded integrally with the film web. The flap member of the bag may also be formed by inserting a fold in the film web thereby forming a flap. The adhesive strip 30 may be post applied to the film web in a separate step or applied to the film web simultaneously during extrusion of the film web. Various conventional methods can be used to affix the adhesive on the film web including, for example, the process described in U.S. Pat. No. 4,392,497, incorporated herein by reference. Substantially simultaneous or in a separate step, the film web is embossed to form the roughened surface 50 and the embossed surface 60. Preferably, the film web is embossed on one side of the film web with enough force to substantially simultaneously form the roughened surface 50 and the roughened surface 60. After the web has been embossed, the web is folded and heat sealed by techniques well known in the art to form the final bag structure.

Although specific embodiments of the present invention have been described it is to be understood that modifications and variations may be found by those skilled in the art which are within the spirit and scope of the invention.

What is claimed is:

1. A process for producing a thermoplastic bag with an adhesive closure comprising the steps of:

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forming a channel strip having a base and an upper rib and lower rib, said strip attached transversely across the longitudinal width of a first inner surface of one of a front wall and rear wall of said bag at a preselected distance from the opening of the bag;

affixing an adhesive strip transversely across the longitudinal width of the channel strip and between said upper and lower ribs; and

affixing a flexible flap member strip transversely across the longitudinal width of a second inner surface of one of a front wall and rear wall of said bag at a preselected distance from the opening of the bag and aligning the flap member on the wall opposite from the adhesive strip, said flexible flap member being affixed to said inner surface along one edge of the flexible flap member strip;

substantially All of the surface area of said flexible flap member of said bag being pressable against and into said adhesive strip and between said upper and lower ribs on said first inner surface to form a seal by contacting said adhesive strip with said flap member of said second inner surface.

2. The process of claim 1 wherein the inner surface of the flap member is roughened by embossing.

3. The process of claim 2 including the step of forming a second roughened surface on the outer surface of the wall containing the flap member opposite the first roughened surface.

4. The process of claim 3 wherein the first and second roughened surfaces are formed substantially simultaneously in one step.

5. A process for producing a thermoplastic bag with an adhesive closure comprising the steps of:

attaching a channel strip having a base and an upper rib and a lower rib across the longitudinal width of a first inner surface of one of a front wall and rear wall of said bag at a preselected distance from the opening of the bag;

affixing an adhesive strip transversely across the longitudinal width of the channel strip and between said upper and lower ribs; and

affixing a flexible flap member strip transversely across the longitudinal width of a second inner surface of one of a front wall and rear wall of a bag at a preselected distance from the opening of the bag and aligning the flap member on the wall opposite from the adhesive strip, said flexible flap member being affixed to said inner surface along one edge of the flexible flap member strip;

substantially all of the surface area of said flexible flap member of said bag being pressable against and into said adhesive strip and between said upper and lower ribs on said first inner surface to form a seal by contacting said adhesive strip with said flap member of said second inner surface.

6. The process of claim 5 wherein the inner surface of the flap member is roughened by embossing.

7. The process of claim 6 including the step of forming a second roughened surface on the outer surface of the wall containing the flap member opposite the first roughened surface.

8. The process of claim 7 wherein the first and second roughened surfaces are formed substantially simultaneously in one step.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 5,783,012
DATED : July 21, 1998
INVENTOR(S) : Jose Porchia et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, "Related U.S. Application Data", and Column 1, line 5,
Line 5, replace [5,487,653] with 5,564,834.

Claim 1,
Line 19, replace [All] with all.

Claim 5,
Line 13, replace [tear] with rear.

Signed and Sealed this

Twenty-seventh Day of November, 2001

Attest:

Nicholas P. Godici

Attesting Officer

NICHOLAS P. GODICI
Acting Director of the United States Patent and Trademark Office



US005818719A

United States Patent [19]
Brandon et al.

[11] **Patent Number:** **5,818,719**
[45] **Date of Patent:** **Oct. 6, 1998**

[54] **APPARATUS FOR CONTROLLING THE
REGISTRATION OF TWO CONTINUOUSLY
MOVING LAYERS OF MATERIAL**

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[21] **Appl. No.:** **593,980**

[22] **Filed:** **Jan. 30, 1996**

Related U.S. Application Data

[63] **Continuation-in-part of Ser. No. 581,146, Dec. 29, 1995,
abandoned.**

[51] **Int. Cl.⁶ B65H 23/00; B31B 01/88;
G06F 19/00**

[52] **U.S. Cl. 364/469.04; 226/2; 364/469.01;
364/469.03; 493/3; 493/11; 493/187; 493/381**

[58] **Field of Search 53/51; 226/2, 27,
226/28, 29, 32, 109; 364/400, 469.01, 469.03,
469.04, 550; 493/3, 11, 37, 186, 187, 189,
210, 264, 374, 379, 380, 381**

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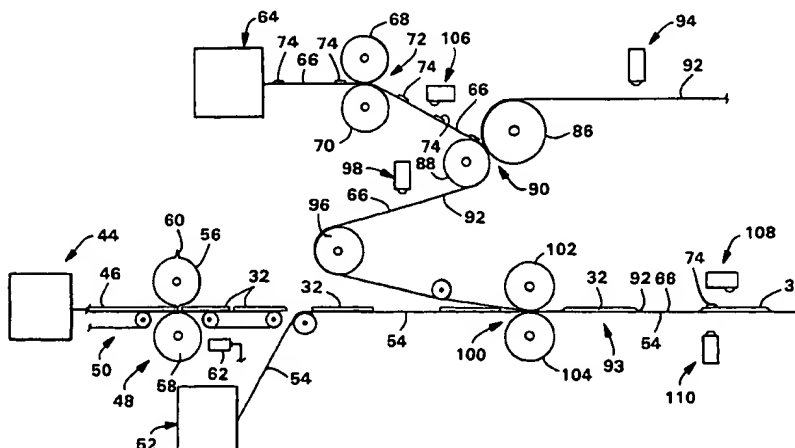
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Primary Examiner—Edward R. Cosimano
Attorney, Agent, or Firm—Douglas L. Miller

[57] ABSTRACT

An apparatus for controllably registering two continuously moving layers of material is provided. One of the layers of material has a plurality of reference marks representing a plurality of separate and distinct components, and the other of the continuously moving layers has a respective plurality of different components thereon. The apparatus controls the distance between reference marks to a selected distance, and controllably registers each reference mark to a respective component of the continuously moving second layer. An article is provided in which a graphic is controllably registered within a designated area thereof.

4 Claims, 8 Drawing Sheets



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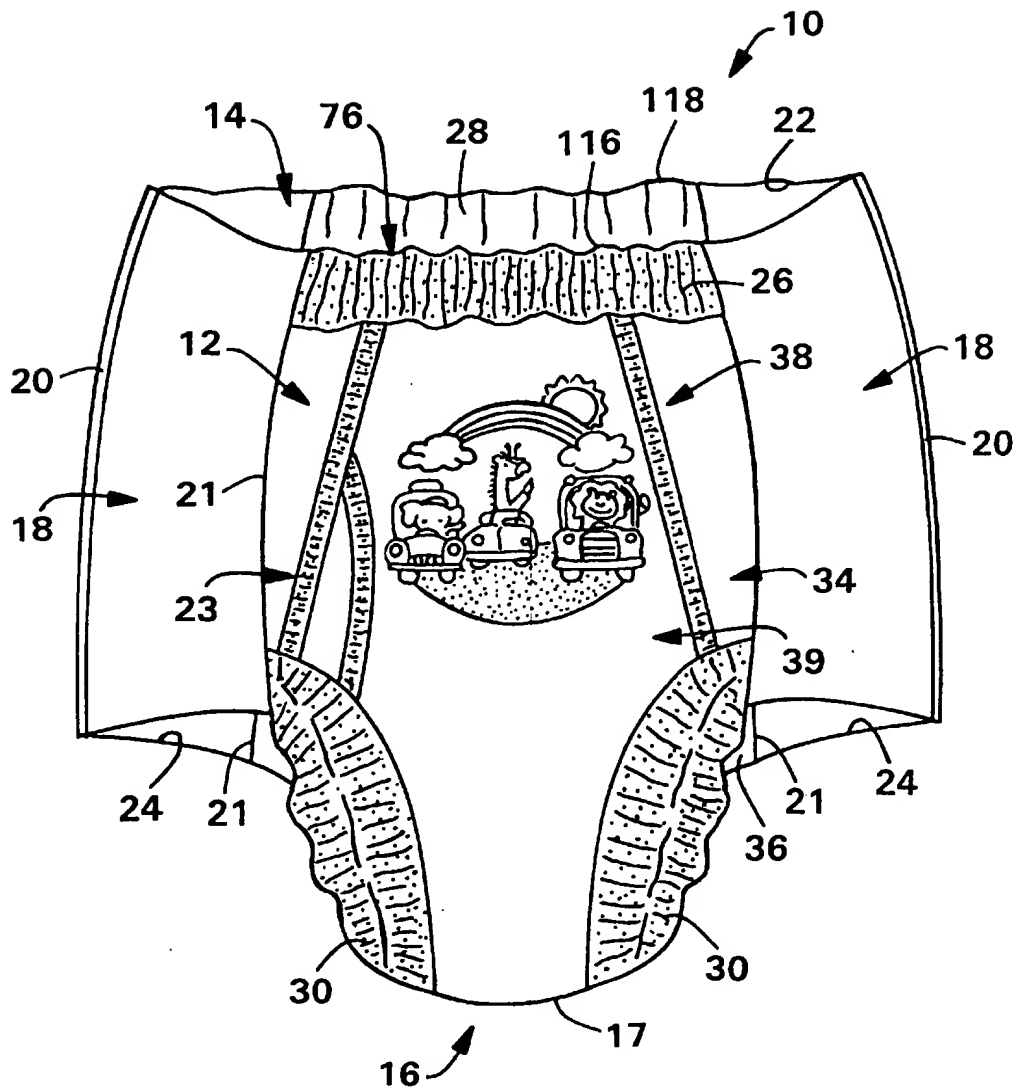
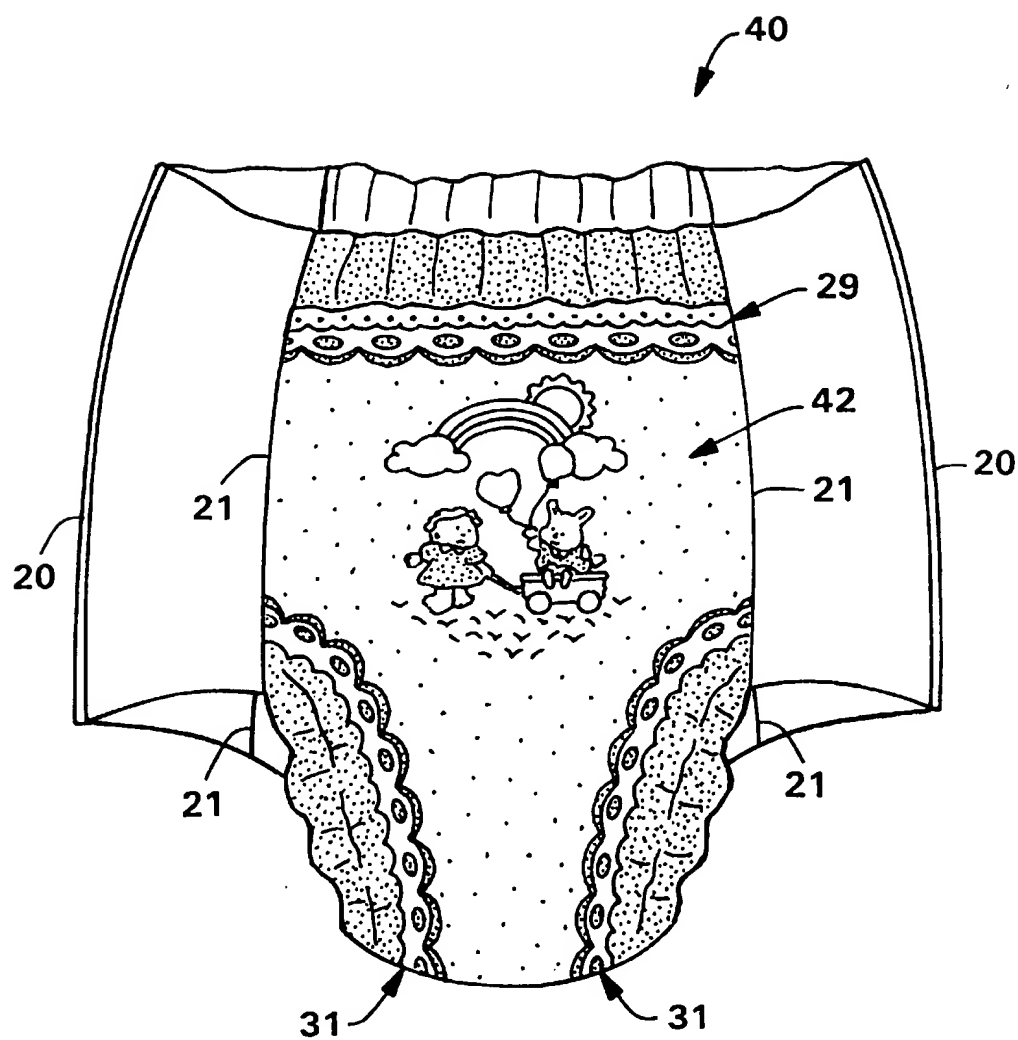


FIG. 1

**FIG. 2**

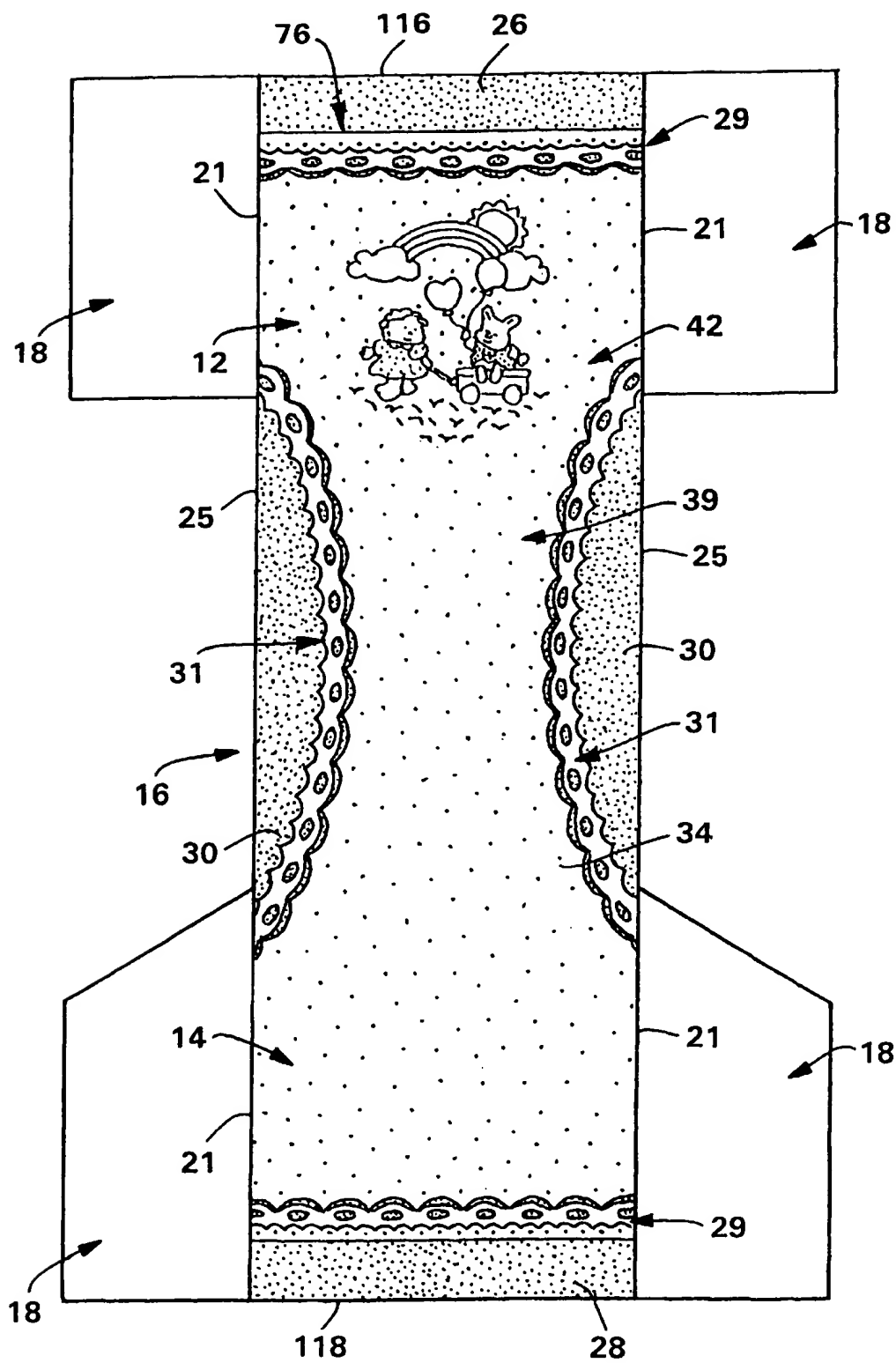


FIG. 2A

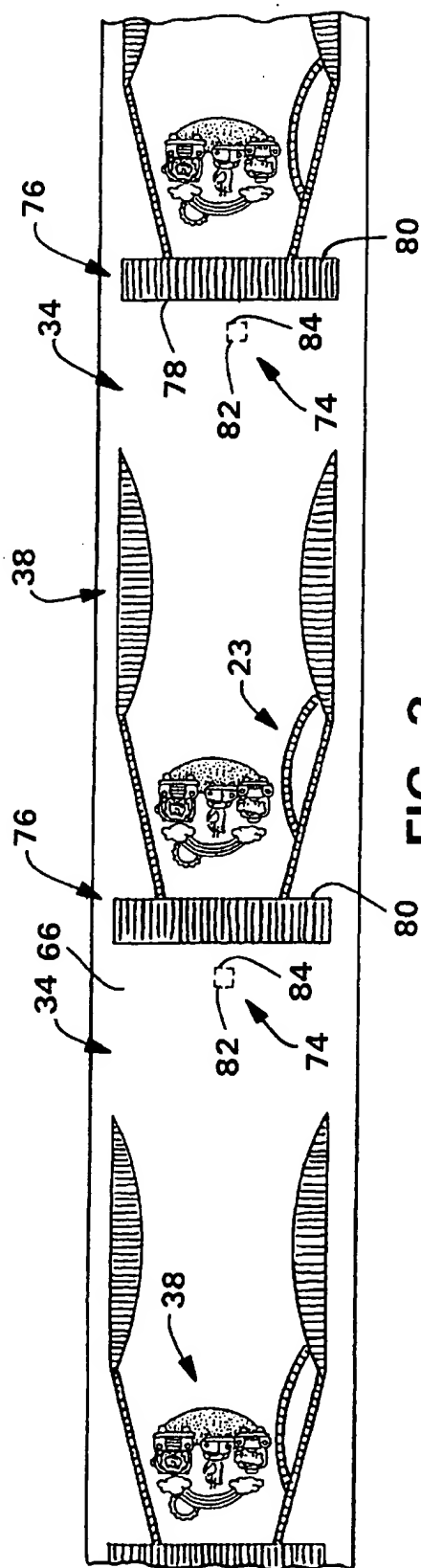


FIG. 3

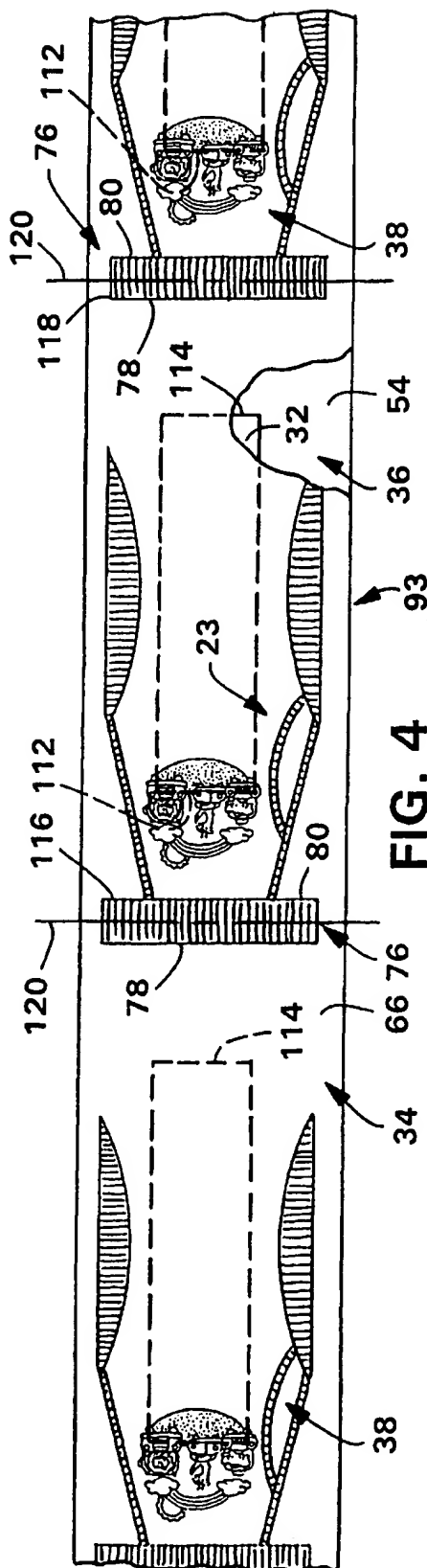


FIG. 4

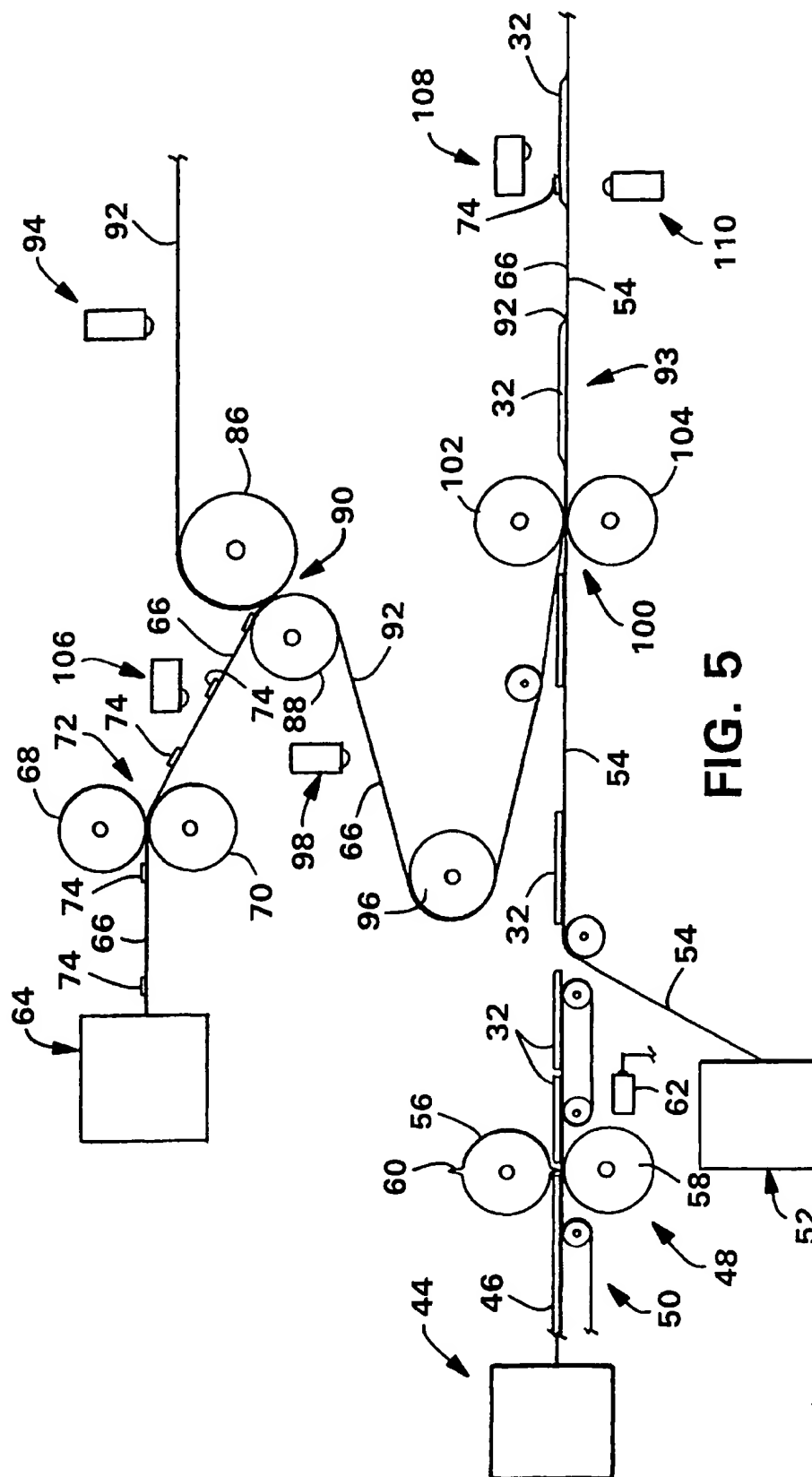


FIG. 5

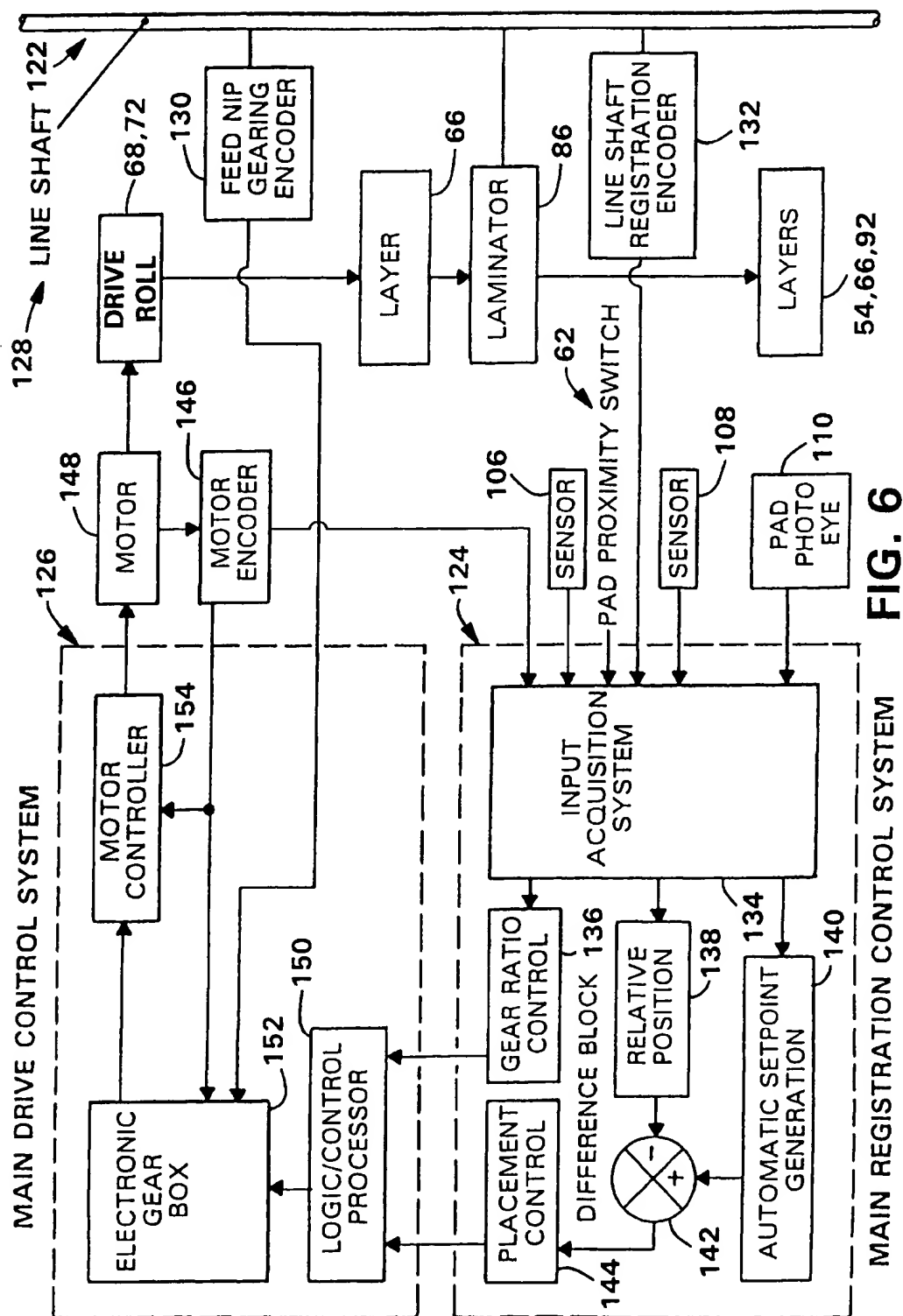
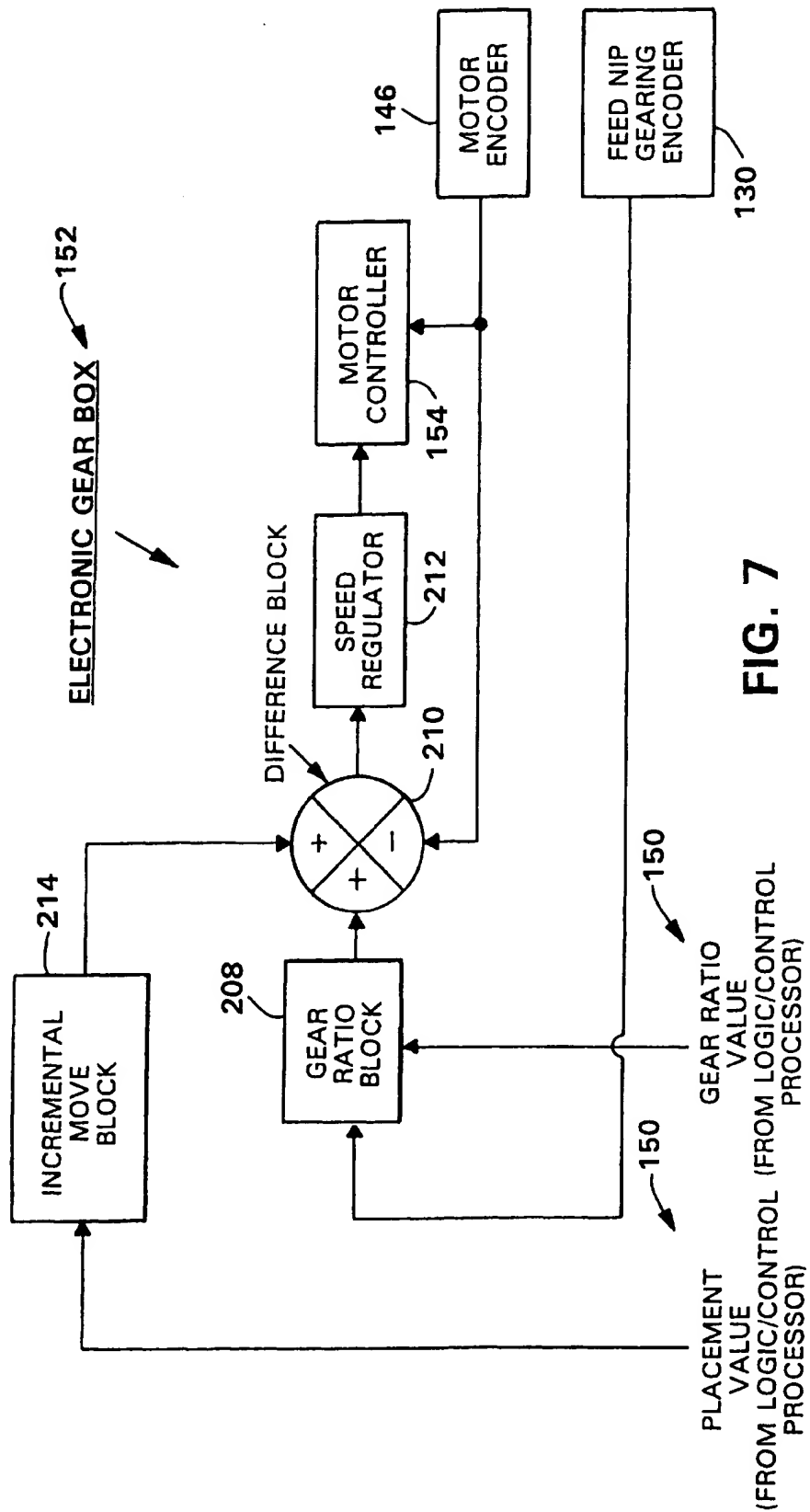
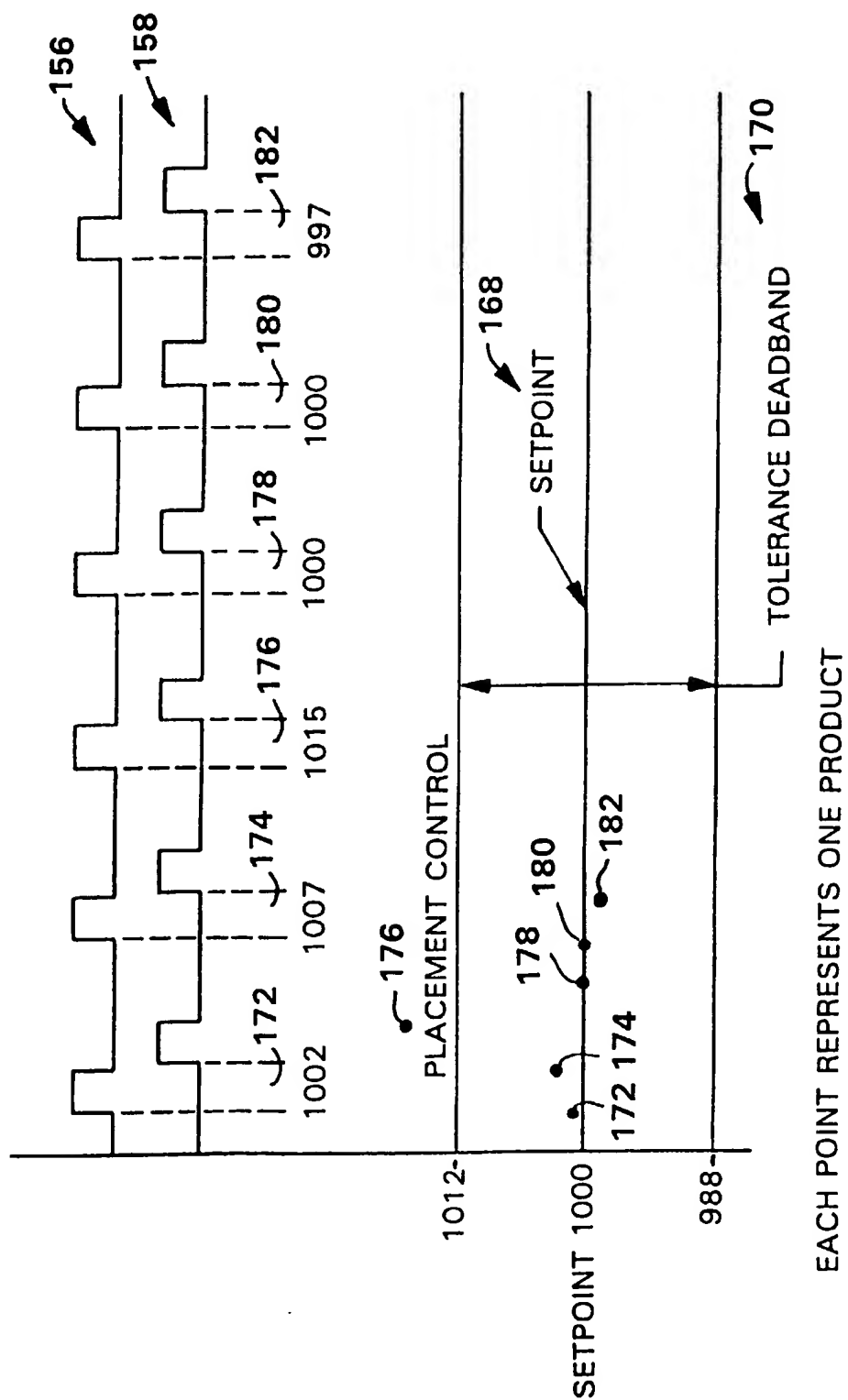


FIG. 6





APPARATUS FOR CONTROLLING THE REGISTRATION OF TWO CONTINUOUSLY MOVING LAYERS OF MATERIAL

This application is a continuation-in-part of U.S. patent application Ser. No. 08/581,146 filed Dec. 29, 1995, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for controlling registration, and more particularly to apparatus for controlling the registration of two continuously moving layers of material, and articles made thereby.

Various products are fabricated in a continuous production line by the sequential addition of components to previously supplied components. This is particularly advantageous when one or more of the components can be supplied in the form of a single continuous layer. For example, in the formation of disposable absorbent articles, such as training pants, diapers, incontinence articles, feminine care products, or the like, a layer is normally supplied at a point in the fabrication line in the form of a continuous roll, and absorbent pads, waist elastic bands, leg elastic bands, stretchable side panels, and/or other elements or components can be supplied at different points in the fabrication line as discrete objects.

Various methods and apparatus are available for bringing the components of a single product together so that the components in the composite product are in a desired relation with respect to each other. In bringing these components properly together, various known methods and apparatus are used to note the position of a particular component, and then to adjust the position of subsequent components in order to properly position them.

A problem encountered with these types of methods and apparatus is that they do not adequately compensate for the stretching of a continuously moving layer. During manufacturing processes of this type, a continuously moving layer is subjected to various tensions caused by it being driven or pulled through the process for handling. This tension causes the continuously moving layer to stretch, or to relax, thereby resulting in some components being undesirably positioned or, once positioned, shifted out of position. Since it is virtually impossible to maintain a constant tension on the continuously moving layer, the degree of stretching varies throughout the process. Consequently, even though an earlier positioned component may initially be within an acceptable position range, the stretching of the continuously moving layer may result in the component being outside of the acceptable position range in the final composite product.

Another problem with current methods and apparatus is that they do not provide an adequate means for registering two continuously moving layers, and particularly when one of the layers has a pre-printed or pre-positioned component or the like that is to be registered with a pre-printed or pre-positioned component or the like on the other of the layers during the manufacture of a plurality of products having a desired registration of components.

SUMMARY OF THE INVENTION

In response to the discussed difficulties and problems encountered in the prior art, an apparatus for controlling the registration of two continuously moving layers, has been discovered.

In one form of the invention, there is provided an apparatus for controllably registering a plurality of reference

marks of a continuously moving first layer with a plurality of corresponding reference marks of a continuously moving second layer. The apparatus includes means for providing a continuously moving first layer including a plurality of reference marks selectively positioned thereon, means for providing a continuously moving second layer including a plurality of corresponding reference marks selectively positioned thereon, means for sensing each of the reference marks of one of the continuously moving layers and means for generating a signal in response thereto, means for measuring the distance between two reference mark signals, means for adjusting the length of the continuously moving one layer in response to the measured distance, means for super imposing the continuously moving layers together, means for detecting a reference mark of the continuously moving one layer and its corresponding reference mark of the continuously moving other layer and means for generating a signal in response thereto, and means for adjusting the speed of the continuously moving one layer in response to a generated signal in accordance with pre-programmed instructions to controllably register a reference mark of the continuously moving one layer with its corresponding reference mark on the continuously moving other layer.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features of the present invention and the manner of attaining them will become more apparent, and the invention itself will be better understood by reference to the following description of the invention, taken in conjunction with the accompanying drawings wherein:

FIG. 1 illustrates a front view of one article having a registered graphic thereon;

FIG. 2 illustrates a front view of another article having a registered graphic thereon;

FIG. 2A representatively illustrates the article of FIG. 2 in a partially disassembled, stretched flat state;

FIG. 3 illustrates a continuously moving layer having a plurality of separate and distinct graphics thereon;

FIG. 4 illustrates a continuously moving composite layer having a plurality of separate and distinct graphics thereon;

FIG. 5 schematically illustrates an apparatus and process for the manufacture of an article having a registered graphic thereon;

FIG. 6 illustrates a schematic block diagram of the flow of data utilized in conjunction with the apparatus and process in FIG. 5;

FIG. 7 illustrates a block diagram of the electronic gear box in FIG. 6; and

FIG. 8 graphically illustrates a placement control utilized in conjunction with the apparatus and process in FIG. 5.

DETAILED DESCRIPTION

The following detailed description will be made in the context of registering and controlling the registration of one continuously moving layer with respect to a second continuously moving layer in the manufacture of disposable absorbent articles, and specifically a child's training pant. Examples of other disposable absorbent articles include, but are not limited to, diapers, feminine care products, incontinence products, or the like. The present invention also contemplates other products or devices unrelated to disposable absorbent articles. For the purposes of this description, the term "product" can refer, but is not limited, to any article, device, laminate, composite, or the like. The term "compo-

nent" can refer, but is not limited, to designated selected regions, such as edges, corners, sides or the like; structural members, such as elastic strips, absorbent pads, stretchable layers or panels, layers of material, or the like; or a graphic. The term "graphic" can refer, but is not limited, to any design, pattern, or the like.

A child's disposable training pant can have multiple appearance-related and/or functional components registered within selected machine-direction (MD) and/or cross-direction (CD) ranges. The term "machine-direction" refers to the primary direction of movement of continuously moving layers in the manufacturing process, and the term "cross-direction" refers to a direction transverse to the machine-direction. The described example herein is that of registering a graphic within a designated area of the product.

Thus, the present invention can provide a child's disposable training pant having one or more appearance-related or functional components registered with other components. Examples relating to components that are appearance-related include, but are not limited to, the registration of graphics; highlighting or emphasizing leg and waist openings in order to make product shaping more evident or visible to the user; highlighting or emphasizing areas of the product to simulate functional components such as elastic leg bands, elastic waistbands, simulated "fly openings" for boys, ruffles for girls; highlighting areas of the product to change the appearance of the size of the product; registering wetness indicators, temperature indicators, and the like in the product; registering a back label, or a front label, in the product; and registering written instructions at a desired location in the product.

Examples of functional components include, but are not limited to, waist elastics, leg elastics, areas of breathability, fluid repellent areas, fluid wettable areas, adhesives or coatings, encapsulated inks, chemically-sensitive materials, environmentally-sensitive materials, heat-sensitive materials, moisture-sensitive materials, perfumes, odor control agents, inks, fasteners, fluid storage areas, textured or embossed areas, or the like.

The training pant described herein, by way of example, comprises an absorbent pad positioned between a liquid impermeable outer cover and a liquid permeable liner. The training pant further includes elastic side panels which are joined to the outer cover in order to provide elasticity thereto. The liquid impermeable outer cover can comprise two layers of material suitably joined together, in which the innermost layer can be a liquid impermeable layer and the outermost layer can be a nonwoven layer having cloth-like texture. The innermost liquid impermeable layer has a graphic printed in registration thereon. The registered graphic generally includes a visually pleasing design or pattern and is controllably registered at a designated area in the product. One registered graphic includes a graphic positioned on the front center of the product. This graphic is preferably circular and is about 76 millimeters in dimension, and can range in size from about 25 millimeters to about 130 millimeters. The center of the graphic is about 83 millimeters from the front edge of the waist opening. The graphic may include simulated elastic leg bands, a simulated elastic waistband, a simulated "fly opening" for boys, simulated ruffles for girls, or the like.

A more detailed description of the construction and design of the above-described training pant can be found in U.S. Pat. No. 4,940,464 issued Jul. 10, 1990, the contents of which are incorporated by reference herein.

Described herein is a distinctive process and apparatus for registering a plurality of distinct and separate components

on a continuously moving first layer of material with a respective plurality of distinct and separate components on a continuously moving second layer of material. The second layer of material has the components suitably represented by respective reference marks, both provided thereon at a uniform repeat length shorter than a machine product repeat length. The distance between two successive reference marks is determined and then used to calculate a desired speed for the current process conditions. The second layer of material is then controllably stretched or relaxed so that the distance between two successive reference marks substantially equals the selected distance, which in this case is one machine product repeat length; this is termed the "repeat loop". The second layer is then controllably registered to the first layer of material so that each reference mark is selectively registered with a respective component; this is termed the "placement loop". The amount of stretch or relaxation can be controllably adjusted by varying the speed and/or tension of the second layer. The term "reference mark" can refer, but is not limited, to structure such as waist or leg elastics, adhesive beads, corners or edges of structure, transporting mediums such as conveyor belts, visual marks, magnetic marks, electrical marks, electromagnetic marks, optical brighteners sensitive to ultraviolet radiation, or the like, all of which can be sensed, detected, or otherwise identified by an appropriate device. The term "machine product repeat length" refers to a selected distance, which in this example is the measured distance between successive, like components during manufacture. For example, between successive waist bands, absorbent pads, or the like. Or in other words, the machine product repeat length is the length of one product during the manufacturing process. Thus, when a reference mark is registered with a component of the first layer, then the component represented by that reference mark is registered with the component of the first layer.

With regard to the repeat loop, the second layer has the reference marks selectively provided thereon to correspond to a respective plurality of distinct and separate components, such as graphics. A first sensor generates a signal in response to each reference mark. The distance between each newly generated signal and the most recently preceding signal is suitably measured in units of a driving mechanism, so that the speed of the driving mechanism can be selectively controlled to adjust the speed and/or tension of the second layer to controllably stretch or relax the second layer, such that the distance between a subsequent newly generated signal and its most recently preceding signal is one machine product repeat length. Thus, the repeat loop refers to repeatedly duplicating a product length between two successive reference marks by accurately measuring their current distance apart and calculating a desired speed reference for a main drive control system.

With regard to the placement loop, a desired registration of a reference mark to a component is performed by comparing and controlling a related datum value to a target set point. A "datum value" refers to a measured distance between a reference mark and a machine-generated constant reference signal. A "target set point" refers to a selected value within which the datum value is maintained.

There is described herein, by way of example, a distinctive process and apparatus for using a preprinted, stretchable second layer of material including a plurality of distinct and separate graphics thereon, stretching this second layer to a selected length by varying the speed and/or tension thereof, and then applying and registering it to another layer that includes preassembled, preapplied components, such as absorbent pads, thereby providing a manufacturing process

for individual disposable absorbent articles having graphics registered thereon at designated areas. The process and apparatus can also be used to apply, during manufacture, other various functional and appearance related components that have been printed, joined, positioned, or the like, on a layer at a specified location so as to be selectively registered in the final product.

The second layer of material can be a continuous polyethylene film preprinted with a plurality of separate and distinct graphics. The printed graphics are arranged such that they ultimately will be positioned at the same designated area in each finished product. The term "finished" or "final", when used with reference to a product, means that the product has been suitably manufactured for its intended purpose.

The second layer is controllably stretched or relaxed, using tension and/or speed variations, to appropriately correspond the distance between two successive reference marks to the machine product repeat length and to control a related datum value to a target setpoint. This is done in order to register the reference marks to previously processed and preplaced components, such as, by way of example, absorbent pads. The use of the term "stretchable" refers to that property of a material or composite material that permits it to recover at least a portion of its original size and shape after removal of the force causing the deformation. The stretch of the second layer is controlled by increasing or decreasing speed and/or tension using an electronically controlled, motor driven roll. Once the second layer is stretched to the desired or proper length, it may, if desired, be joined to another layer, such as a nonwoven, spunbond web to substantially stabilize the second layer, thereby reducing or eliminating its stretchability. A system of sensors used in conjunction with computer hardware and software inspects for registered location, repeat patterns, and setpoint error. The data received from these sensors is used to control the motor, which adjusts the second layers speed and/or tension as necessary for desired registration. Adjustments to the second layer are made so that the preprinted graphics are desirably registered with a respective plurality of components.

These features advantageously control a layer moving at high speed in order to register it with another layer. In particular, there is provided accurate, real time information during the production process, and rapid adjustments to the process to provide the desired configuration and registration of the reference marks and their associated components in the final product.

The use of the term "layer" can refer, but is not limited, to any type of substrate, such as a woven web, nonwoven web, films, laminates, composites, elastomeric materials, or the like. A layer can be liquid and air permeable, permeable to air but impermeable to liquids, impermeable both to air and liquid, or the like.

Each of the separate and distinct graphics on the continuously moving layer has a reference mark associated therewith. This means that each reference mark is selectively positioned with regard to a respective graphic, so that the reference mark can be sensed and appropriately registered in the product, thereby properly registering each graphic in its product. Earlier, a reference mark was described in terms of specific examples, and in the following description the reference mark is selected as an optical brightener. A reference mark, whether an optical brightener or other means, can be configured in any desired size or shape. The reference mark may comprise a generally rectangular region having a

machine direction dimension of about 19 millimeters and a cross direction dimension of about 37 millimeters. Other dimensions optionally may be employed. It is to be understood that the various detecting and sensing means described herein are to be appropriately compatible with the type of associated reference mark that is to be detected or sensed. The term "associated" refers to the reference mark either being directly on a component that it represents, such as a graphic, or being selectively spaced therefrom. The optical brightener is provided to be sensitive to ultraviolet radiation. The optical brightener is, for example, capable of absorbing ultraviolet radiation and then fluorescing to emit light spectra that can be sensed by an appropriate and compatible detector or sensor. Ultraviolet radiation is generally understood to include electromagnetic radiation having wave lengths ranging from about 20–400 nanometers. Suitable optical brighteners include, for example, UVITEX OB manufactured by Ciba-Geigy, and LEUCOPURE EGM manufactured by Sandoz Chemicals Corporation.

Where the reference mark comprises ultraviolet sensitive optical brighteners, a suitable detector or sensor is a UV activated detector, such as a SICK detector model LUT 2-6 available from SICK OPTIK ELEKTRONIK, INC., a business having offices in St. Paul, Minn.

Other suitable reference marks, as well as sensors, computer devices, motors, and the like are described in U.S. Pat. No. 5,235,515; U.S. Pat. No. 5,359,525; and U.S. Pat. No. 4,837,715; the contents of these three aforementioned U.S. patents being incorporated by reference herein.

The described process and apparatus utilize several devices, and representative devices include encoders, signal counters, and sensors. An encoder generates a pulse train, which is a selected number of pulses per revolution of the encoder shaft, for subsequent counting and control. A signal counter receives a generated pulse train from an encoder, and counts the pulses for subsequent query. A sensor senses an occurrence or interruption in a process and generates a signal in response thereto.

Referring now to FIG. 1, there is illustrated a child's disposable training pant 10 generally comprising a front panel 12, a back panel 14, a crotch panel 16 interconnecting front and back panels 12, 14, and a pair of elastic side panels 18. Each elastic side panel 18 is formed from two separate elastic portions (FIG. 2A) and are suitably joined together, such as by ultrasonic bonding, to form a side seam 20. Upon the construction of side seams 20, a waist opening 22 and leg openings 24 are formed. The side seams 20 may be constructed to be manually tearable in order to allow training pant 10 to be disassembled manually by the caregiver, so that it can be easily removed from the child after a bowel movement. The elastic side panels 18 (FIG. 1) and side seams 20 can be provided in any suitable manner. One specific manner of supplying elastic side panels 18 is described in U.S. Pat. No. 5,224,405 and U.S. Pat. No. 5,104,116, both of which are incorporated by reference herein. The provision of side seams 20 can be accomplished in the manner described in U.S. Pat. No. 5,046,272, which is incorporated by reference herein.

Training pant 10 further comprises a front waist elastic 26 suitably joined to front panel 12, a back waist elastic 28 suitably joined to back panel 14, leg elastics 30 suitably joined to crotch panel 16, and an absorbent pad 32 (FIG. 4) positioned between a liquid impermeable outer cover or backsheet 34 (FIG. 1) and a liquid permeable liner or topsheet 36. The basic construction of a training pant is well known in the art, and one particular construction is that

described in U.S. Pat. No. 4,940,464, issued Jul. 10, 1990, the contents of which are incorporated by reference herein. U.S. Pat. No. 4,940,464 also describes various materials of which a training pant can be made, and the methods of constructing the training pant.

As illustrated in FIG. 1, a registered graphic 38 is selectively positioned on front panel 12, and in this illustration comprises a design of a simulated "fly opening 23", typical of a boy's underwear, and a rainbow, sun, clouds, and cars. The registered graphic 38 can be any type of desired pattern, artistic feature, written instructions, or the like, and is desired to be positioned in the article at a selected location. Naturally, registered graphic 38 comprising a simulated fly opening 23 would be totally unacceptable from an aesthetic and/or functional viewpoint if it were located at crotch panel 16 or back panel 14.

Referring to FIG. 2, another training pant 40 is illustrated, which can be typically used for young girls. In this design, a registered graphic 42 includes simulated waist ruffles 29, simulated leg ruffles 31, a rainbow, sun, clouds, wagon and balloon. Again, any suitable design can be utilized for a training pant intended for use by young girls, so as to be aesthetically and/or functionally pleasing to them and the caregiver.

Registered graphic 38 in FIG. 1 or registered graphic 42 in FIG. 2 can be controllably registered as desired, depending upon the size and shape of the graphic and that portion of the article upon which the graphic is to be registered. In FIG. 1, graphic 38 is controllably registered within a designated area 39 which, as viewed in FIG. 1, is bounded or defined by a front waist edge 116, panel seams 21, and a crotch panel line 17. Panel seams 21 are the seams at which the respective elastic side panels 18 are suitably joined to front panel 12 and back panel 14. Again, a more specific description of the construction and manufacture of this design of a training pant 10 is contained in the aforementioned U.S. Pat. No. 4,940,464. The crotch panel line 17 is, for purposes of explanation herein, simply the line or boundary formed at the bottom of crotch panel 16 as illustrated in FIG. 1. Thus described, designated area 39 has four defined boundaries comprising front waist edge 116, panel seams 21, crotch panel line 17, and those portions of leg openings 24 extending between a respective panel seam 21 and crotch panel line 17. It is not necessary that a designated area 39 be completely defined or bounded by a closed line or closed boundary. For example, in FIG. 1, the designated area 39 could be defined by only front waist edge 116, panel seams 21, which sufficiently define a designated area 39 in which a graphic 38 can be controllably registered. In this case, the graphic 38 can be controllably registered a selected distance from front waist edge 116, and centered between panel seams 21.

Another example of the flexibility in choosing a designated area 39 is illustrated in FIG. 2A, which illustrates the training pant 40 in FIG. 2 in a partially disassembled, stretched flat state. This can be accomplished by taking the finished training pant 40 of FIG. 2 and manually tearing seams 20 and then laying the pant 40 flat and stretching it sufficiently to remove any gathers or pleating caused by any incorporated elastic members. In FIG. 2A, designated area 39 is defined or bounded by front waist edge 116, panel seams 21, back waist edge 118, and a pair of leg opening edges 25 extending between respective panel seams 21. Thus, in FIG. 2A, designated area 39 is generally rectangular in shape, and registered graphic 42 is registered within and throughout the surface area of designated area 39. Registered graphic 42 comprises several component designs, such

as simulated leg ruffles 31 and simulated waist ruffles 29. As viewed in FIG. 2A, leg opening edges 25 are linear or straight lines. However, in FIG. 2, simulated leg ruffles 31 provide a perceived curvature or shape to training pant 40, which is one of the unique features herein.

There is uniquely and advantageously provided a very close tolerance in the registration of a desired component, such as graphics 38, 42, within any selected area, such as a designated area 39. With reference to FIG. 1, it is apparent that the simulated fly opening 23 of graphic 38 needs to be registered within front panel 12. It would be undesirable to have training pant 10 manufactured by a method and/or apparatus that could not control the proper registration of simulated fly opening 23, otherwise the simulated fly opening 23 could appear at back panel 14 or crotch panel 16. The present invention provides a highly controlled registration of a desired components, such as a graphic 38 or 42, within a desired designated area, such as designated area 39, within a tolerance of about plus or minus 6 millimeters, and within a more particular tolerance between about plus or minus 3 millimeters.

Referring now to FIG. 5, there is schematically shown an apparatus and process for assembling in part a plurality of training pants. A supply means 44 continuously supplies a continuous, tissue-wrapped absorbent 46 to a separating means 48 that separates the continuous, tissue-wrapped absorbent 46 into a plurality of distinct and separate absorbent pads 32. The supply means 44 can be any conventional mechanism for supplying the absorbent 46. Generally, a conventional supply means 44 will include a hammermill for forming fluff fibers and, if desired, for providing an enclosure for mixing superabsorbent material with the fluff fibers, and then depositing the fluff and superabsorbent material on a forming drum having a desired absorbent design. The forming drum then deposits the shaped absorbent on a continuously moving tissue material, which is thereafter delivered to a folding board for folding the tissue about the absorbent. This provides the continuous, tissue-wrapped absorbent 46. The absorbent can include any desired mixture or blend of absorbing materials, such as fluff and superabsorbent materials. Suitable superabsorbent materials are available from various commercial vendors such as Dow Chemical Company, Hoechst-Celanese Corporation and Allied Colloids, Inc. Typically, a superabsorbent material is capable of absorbing at least about 15 times its weight in water, and desirably more than about 25 times its weight in water. A preferred fluff is that identified with the trade designation CR1654, available from Kimberly-Clark Corporation, Neenah, Wis., and is a bleached, highly absorbent sulfate wood pulp containing primarily soft wood fibers.

A conveyor means 50, which can be any conventional conveyor means well known in the art, conveys the absorbent 46 to the separating means 48. A supply means 52 provides a continuously moving first layer of material 54, upon which can be disposed any desired component, such as the separate and distinct absorbent pads 32 formed by separating means 48. The supply means 52 can be any standard unwind mechanism that generally comprises a pair of spindles, a festoon assembly, and a dancer roll for providing first layer 54 at a desired speed and tension. One example of a standard unwind is a model MB 820, available from Martin Automatic Corporation of Rockford, Ill. The continuously moving first layer of material 54 can be any desired material suitable for the particular product being assembled. In this description of a training pant 10 (FIG. 1), continuously moving first layer 54 is a liquid permeable

material that will subsequently form or become liquid permeable topsheet 36 (FIG. 1). Topsheet 36 can be made of any suitable materials well known in the art, and examples of suitable materials are described in the aforementioned incorporated U.S. patents.

Upon being moved or delivered to separating means 48, the continuous, tissue-wrapped absorbent 46 is cut into the separate and distinct absorbent pads by a knife roll 56 and an anvil roll 58 comprising separating means 48. The knife roll 56 can have any desired number of blades thereon, and in this example has two blades 60 diametrically disposed thereon for forming absorbent pads 32. Knife roll 56 is driven by and mechanically coupled through gearing to anvil roll 58, which is operatively driven by a main lineshaft 128 (FIG. 6) in any suitable manner well known in the art. A constant reference means, such as a proximity switch 62, is coupled to anvil roll 58 for generating a reference signal for each cut absorbent pad 32. For purposes herein, the separating means 48 is operated at a substantially constant speed during the manufacturing process so that each reference signal generated by proximity switch 62 is considered a machine constant reference signal for purposes of comparison to other signals hereafter described. The machine-generated constant reference signal from proximity switch 62 is transmitted to a main control system for further processing as described hereafter.

The distinct and separate absorbent pads 32 formed by separating means 48 are positioned upon the continuously moving first layer of material 54 provided by supply means 52. It is well known in the art to separate and position individually cut absorbent pads onto a continuously moving layer, and any such suitable mechanism can be utilized herein.

A supply means 64, which can be a standard unwind similar to that used with reference to the supply means 52, provides a continuously moving second layer 66 of material that will subsequently be joined to continuously moving first layer 54. The continuously moving second layer 66 can be any material suitable for the finished product, and in this particular description is a liquid impermeable film that will subsequently form liquid impermeable outer cover 34 (FIG. 1). One desired suitable liquid impermeable film is a 0.75 mil polyethylene film commercially available from Edison Plastics Company of South Plainfield, N.J. Continuously moving second layer 66 is moved toward a pair of rolls comprising a drive roll 68 and a support roll 70 that form therebetween a feed nip 72. Drive roll 68 can be driven by any suitable motor, such as those described in the U.S. patents incorporated by reference herein. A suitable feed nip motor is a HR 2000 brushless AC servo motor available from Reliance Electric Company, of Cleveland, Ohio. The material of which second layer 66 is made is desirably stretchable, in that it can be stretched, by way of example only, between about 5 to about 15 millimeters. Other materials having greater or lesser stretch can be utilized as the material or materials for second layer 66.

It is important that the feed nip motor 148 (FIG. 6) and its drive system, which operates drive roll 68, is one that is capable of performing two types of speed variations, as controlled by the main control system, which will be described in greater detail hereafter. One speed variation is to increase a present speed of the rotation to a faster speed of rotation, or to decrease a present speed of rotation to a slower speed of rotation. The other speed variation is a momentary speed variation comprising an incremental advance phase move, which is a momentary speed increase of drive roll 68 to provide a measured increased amount of

the layer of material, or an incremental retard phase move, which is a momentary speed decrease of drive roll 68 to provide a measured decreased amount of the layer of material. The term "momentary speed increase" refers to increasing a first speed to a higher second speed for a selected period of time, and then causing or allowing the speed to return to the first speed, in order to advance the position of the layer and the associated graphics upstream of the nip by a measured amount. The term "momentary speed decrease" refers to decreasing a first speed to a lower second speed for a selected period of time, and then causing or allowing the speed to return to the first speed, in order to retard the position of the layer and the associated graphics upstream of the nip by a measured amount.

As described earlier, the present invention can be utilized to register two continuously moving layers together, so that a reference mark and/or product component of one layer is registered with a reference mark and/or product component on the second layer. In this particular description, a component, such as a registered graphic 38 (FIG. 1) on continuously moving second layer 66 (FIG. 5) is brought in registration with a component, such as an absorbent pad 32, on continuously moving first layer 54. By controllably registering a registered graphic 38 with an absorbent pad 32, the desired position of registered graphic 38 on a front panel 12 (FIG. 1) of a training pant 10 can be accomplished. An important function of a registered graphic 38 on a front panel 12 is that it visually informs the user of the proper orientation of the training pant 10 for donning purposes, thereby permitting the training pant to properly function, i.e., absorb waste, among other functions. The continuously moving layer 68 has, by way of example, preprinted thereon a plurality of separate and distinct graphics 38, understanding again that a graphic 38 can be any desired design or pattern, such that the graphics 38 can be registered with the separate and distinct absorbent pads 32 on continuously moving layer 54. There is associated with each graphic 38 a preprinted reference mark 74, which in this case is an optical brightener. The graphics 38 and their respective reference marks 74 can be provided on layer 66 in any suitable manner well known in the art.

With reference to FIG. 3, there is illustrated a portion of continuously moving layer 66 having a plurality of the graphics 38 and reference marks 74 preprinted or positioned thereon. Associated with each graphic 38 is a printed waistband 76 with a printed front edge 78 and a printed back edge 80. Similarly, each reference mark 74 has a reference front edge 82 and a reference back edge 84. Each reference mark 74 will be used to properly position an associated graphic 38 with an absorbent pad 32. The reference marks 74 are positioned off graphics 38, but could be printed directly on the graphics 38 so as to be within the design of the graphics. Furthermore, the reference marks 74 can be eliminated, and a portion of a graphic 38 can be used as the reference mark. For example, a detectable mark or the like could be printed as part of the waistband 76 and thereafter used for properly registering the graphic 38. However, for purposes of explanation and manufacture, reference marks 74 are provided a selected distance apart from respective graphics 38.

In the following description, the continuously moving second layer 66 will be described, by way of example, as being joined or laminated to another third layer 92 (FIG. 5) of material in order to produce a two-layered laminate 93 that ultimately will form the liquid impermeable outer cover 34 (FIG. 1). The polyethylene film material of which layer 66 is made serves as a liquid impermeable barrier, while the

third layer of material joined to layer 66 will provide cloth-like texture to the outer cover. The cloth-like layer will be the outermost layer. There is no requirement, however, for the third layer, and in some product designs, the cloth-like layer can be eliminated.

Layer 66 is driven or moved toward a laminator chill roll 86 and an associated support roll 88, which form therebetween a laminator nip 90. A continuously moving layer 92 is provided in any suitable manner, and driven in any suitable manner to laminator chill roll 86. An adhesive applicator 94 applies a desired pattern of a suitable adhesive to the continuously moving layer 92. In this particular embodiment, layer 92 is a nonwoven web, such as a spun-bond polypropylene web having a basis weight of about 20 grams per square meter (gsm). The adhesive applicator 94 can be any suitable applicator well known in the art that can provide or apply the desired pattern of adhesive. The adhesive used can be any suitable adhesive that is compatible to layers 66 and 92, in order to ensure their proper lamination together. Continuously moving layer 92 can be provided by a supply means (not shown) similar to supply means 52 and 64.

Laminator chill roll 86 is driven by the lineshaft 128 (FIG. 6) and assists in moving the layers in the process. The laminator chill roll 86 also serves to cool the adhesive applied by adhesive applicator 94 for processing purposes, thereby preventing adhesives from bleeding through the layers 66 or 92.

Once layers 66, 92 are laminated and pass through laminator nip 90, they are continuously moved to a construction chill roll 96, and have an adhesive applied to the outermost surface of layer 66. Construction chill roll 96 is lineshaft driven by lineshaft 128, similar to chill roll 86. The adhesive applied by adhesive applicator 98 will ultimately join layers 66, 92 to continuously moving first layer 54. Thus, the adhesive applicator 98 is selected to apply the appropriate adhesive pattern and amount of adhesive to ensure the desired joining of the layers 66, 92, and 54. The construction adhesive applicator 98, as well as the adhesive applied thereby, can be any type of applicator suitable for the desired adhesive pattern, and appropriate and compatible for the materials to be joined.

From construction chill roll 96, the laminated layers 66, 92 are then superimposed over continuously moving layer 54, and together the layers pass through a product tacker 100 comprising a drive roll 102 driven by lineshaft 128 (FIG. 6) and a rubber-coated idler roll 104. Tacker 100 compresses the layers together in order to cause the applied adhesive to join layers 66, 92 to continuously moving layer 54, thereby forming a continuously moving composite laminate 93 as illustrated in FIG. 4.

Continuing to refer to FIG. 5, a first sensing means, such as a sensor 106, is suitably positioned between drive roll 68 and laminator chill roll 86 for detecting and generating a signal in response to each reference mark 74. Since the reference marks 74 are ultraviolet-sensitive optical brighteners, a suitable sensor is a SICK detector model LUT 2-6 available from SICK OPTIK ELEKTRONIK, Inc., having a business office in St. Paul, Minn.

Positioned downstream of product tacker 100 are a second and third sensing means, such as a sensor 108 and a photoeye 110. The term "downstream" refers to a left-to-right direction as viewed in FIG. 5, and is also the machine direction for the process. Parenthetically, although layers 66 and 92 are illustrated as moving in a downwardly direction, the primary direction in which they are moving or will

eventually move is in a left-to-right direction, and is also thus termed the downstream direction. Sensor 108 can be the same type of ultraviolet detector as sensor 106. The photoeye 110 is desirably a Banner RSBF scanner block, RPBT wiring base, IR 2.53S fiber-optic pair device, available from Banner Engineering, Corp. of Minneapolis, Minn. Photoeye 110 is designed to optically detect a product component, such as absorbent pad 32, and to generate an electrical signal in response thereto. In this particular description, both sensors 106 and 108 are designed to detect and generate a signal in response to a reference mark 74, and photoeye 110 is designed to detect and generate a signal in response to an absorbent pad 32. If desired, photoeye 110 can sense other components, such as waist elastics, leg elastics, fastening tapes utilized in diapers, or the like. A reference mark also can be associated with each absorbent pad 32 in the same manner that a reference mark 74 is associated with a graphic 38; and in that case, the pad photoeye 110 can be replaced with a sensor similar to sensors 106, 108. Similarly, sensors 106, 108 can be replaced with other sensors, similar to photoeye 110, in order to optically detect a product component or other structure in order to generate an appropriate signal.

With reference to FIG. 4 and FIG. 5, there is illustrated a continuously moving composite laminate 93 comprising layers 66, 92, and 54 after they have been joined together by product tacker 100. Each printed waistband 76 will ultimately be cut along a respective cut line 120 in order to form individual products. In FIG. 4, once cut lines 120 have been separated, a front waist edge 116 and a back waist edge 118 are formed for each assembled product. Each absorbent pad 32 includes a front edge 112 and a back edge 114. One of the important features in FIG. 4 is the relative placement of a graphic 38 with respect to each product that will eventually be formed. Each graphic 38 is located in the front panel 12 (FIG. 1) and is located in the same position relative to an absorbent pad front edge 112 (FIG. 4). Naturally, other marks or product components can be in registration with other different reference marks or product components. For example, a simulated waist ruffle 29 (FIG. 2) can be registered relative to a waist opening, or leg elastics, such as leg elastics 30 (FIG. 1), can be desirably registered in relation to an absorbent pad, such as absorbent pad 32 (FIG. 4).

Referring to FIG. 6, there is schematically illustrated a main control system with the mechanical side 122. The main control system comprises a main registration control system 124 that receives various generated signals, processes them in accordance with programmed instructions, and generates output signals to a main drive control system 126. The main drive control system 126 receives the signals from the main registration control system 124, and in response thereto operatively adjusts drive roll 68 (FIG. 5).

Mechanical side 122 comprises a lineshaft 128 that directly drives selected mechanisms or, through a system of gears and other coupling devices, both electrical and mechanical, indirectly drives other mechanisms. Lineshaft 128 is driven at a constant speed, by any suitable means known in the art. Thus, those mechanisms driven by lineshaft 128 are also driven at a constant speed, which may or may not be the same speed as that of lineshaft 128. Specifically, a feed nip gearing encoder 130 and a lineshaft registration encoder 132 are operatively coupled to lineshaft 128. Examples of encoders include an H25D-SS-2500-ABZC-8830-LED-SM18 (which can be used as encoder 130), available from BEI Motor System, Co. of Carlsbad, Calif., and a 63-P-MEF-1000-T-0-00 (which can be encoder 132) available from Dynapar Corp. of Gurnee, Ill. Feed nip

gearing encoder 130 is operatively coupled to lineshaft 128 to rotate at a constant speed, and such that four revolutions of encoder 130 represents one machine-generated product length, i.e., a machine product repeat length.

The main registration control system 124 comprises hardware and/or preprogrammed software instructions, and can be represented, with reference to FIG. 6, as comprising an input acquisition system 134, a gear ratio control 136, a relative position 138, an automatic set point generation 140, a difference block 142, and a placement control 144. The main registration control system 124 includes a computer, which can comprise, for example, a VME-based microprocessor, such as a SYS68K/CPU-40B/4-01 available from Force Computers, Inc. of Campbell, Calif.

As illustrated in FIG. 5 and FIG. 6, input acquisition system 134 receives the following six generated signals: (i) a signal from a motor encoder 146 operatively coupled to the feed nip motor 148, (ii) a signal from sensor 106 (FIG. 5), (iii) a signal from proximity switch 62, (iv) a signal from lineshaft registration encoder 132, (v) a signal from sensor 108, and (vi) a signal from photoeye 110. Input acquisition system 134 receives and counts the pulses generated by motor encoder 146 and lineshaft registration encoder 132, and receives signals from sensors 106, 108, proximity switch 62, and photoeye 110. Referencing the accumulated counts of encoder 146 and the accumulated counts of encoder 132, input acquisition system 134 performs preprogrammed instructions that are specific to the respective received signals, and stores the results of the instructions.

The input acquisition system 134 performs the following functions for the gear ratio control 136. A signal counter in input acquisition system 134 counts the pulses from motor encoder 146, and receives signals from sensor 106 in response to each reference mark 74 (FIG. 5). The input acquisition system 134 then measures the counted pulses representing a distance between every two successive reference marks 74, and performs a running average of those measured counts. The term "running average" refers to averaging the same number of data; for example, for each newly received datum input, the latest, i.e., the oldest, datum is removed from the averaging calculation. The averaging of the counts between two successive reference marks 74 creates an average measurement upon which the next gear ratio value will be derived by gear ratio control 136, as opposed to basing a control decision on the measurement from just one pair of reference marks 74. This averaging "smooths out" the measurements, and is necessitated due to the variability of the apparatus and process. The number of measurements to average is controllable, and is set or determined by providing an appropriate instruction via manual input in any suitable manner well known in the art. In conjunction with performing a running average of the measured counts, the input acquisition system 134 performs a filtering function, which is preprogrammed, to filter out signal anomalies. Examples of such signal anomalies include a dirty photoeye, missing or extra reference marks 74, movement or weaving of the layers, measuring the counts outside a preprogrammed range for averaging purposes, known inaccurate data due to registration control events, or the like.

The input acquisition system 134 performs the following functions for the relative position 138. The input acquisition system 134 counts the pulses received from lineshaft registration encoder 132, and receives signals generated by sensor 106 and proximity switch 62. Input acquisition system 134 then determines and records the current accumulated number of pulses upon receiving a signal from sensor

106, and determines and records the current accumulated number of pulses upon receiving a signal from proximity switch 62.

The input acquisition system 134 performs the following functions for the automatic set point generation 140. Input acquisition system 134 counts the pulses received from lineshaft registration encoder 132, and receives the signals generated by sensor 108 and photoeye 110. It then determines and records the current accumulated number of pulses upon receiving a signal from sensor 108, and determines and records the current accumulated number of pulses upon receiving a signal from photoeye 110. Thereafter, input acquisition system 134 calculates the difference between the current accumulated number of pulses from one signal of sensor 108 and the current accumulated number of pulses from an associated signal of photoeye 110; the "associated signal" refers to the signal generated by photoeye 110 (FIG. 5), with the signal from sensor 108, for each machine product repeat length. With these calculated differences, input acquisition system 134 performs a running average and standard deviation for those differences.

The various calculations and functions performed by input acquisition system 134 are utilized by other portions of main registration control system 124 in order to generate commands to main drive control system 126 (FIG. 6). Main drive control system 126 generally comprises a logic/control processor 150, an electronic gear box 152, and a motor controller 154. The main drive control system 126 includes a computer, which can comprise, for example, a Reliance Distributed Control System made by Reliance Electric, Co. The Distributed Control System includes a Reliance Electric Automax Processor and associated hardware. The electronic gear box 152 (FIGS. 6-7) comprises a 2-axis card that is part of the Distributed Control System unit and is used to control the position of motor 148.

Within main registration control system 124, the gear ratio control 136 queries the input acquisition system 134 every 20 products, i.e., every 20 machine product repeat lengths, for the current running average of measured counts representing a distance between successive reference marks 74 (FIG. 5), which is the repeat value. The number of product lengths determining a query from gear ratio control 136 is adjustable, and can be changed manually by the operator. After determining the repeat value, gear ratio control 136 performs a gear ratio calculation in accordance with preprogrammed instructions to determine a new gear ratio value. That new gear ratio value is then transmitted to the logic/control processor 150 of main drive control system 126. The gear ratio value is calculated by dividing the repeat value by the number of encoder counts from the feed nip gearing encoder 130 (FIG. 6) that occur in one machine product repeat length. The advantage of this is the ability to controllably regulate the repeat of reference marks without comparing to a target value, and the ability to rapidly compensate for processing irregularities and changes in the layer of material that can alter the desired repeat of reference marks.

The relative position 138 of main registration control system 124 queries input acquisition system 134 for the current accumulated number of pulses relative to sensor 106, and the current accumulated number of pulses relative to proximity switch 62. Relative position 138 then determines the difference between the two current accumulated number of pulses in order to calculate a relative position of a reference mark 74 (FIG. 5) to the associated proximity switch signal for that specific query for each machine product repeat length. The relative position 138 then generates and transmits to difference block 142 a relative position value.

The automatic set point generation 140 queries the input acquisition system 134 for each machine product repeat length representing a single product. The occurrence of each product, or machine product repeat length, is determined from the lineshaft registration encoder 132, in which two revolutions of lineshaft registration encoder 132 is equivalent to one product length. In this particular example, two revolutions of lineshaft registration encoder 132 is 2,000 counts. The input acquisition system 134 responds to each query from automatic set point generation 140 with the current running average and standard deviation of the difference calculated between the current accumulated number of pulses for one signal of sensor 108 and the current accumulated number of pulses from an associated signal from pad photoeye 110 for each product; the current running average of this calculation is the actual position value. The automatic set point generation 140 then compares a standard deviation with a preset limit, which has been manually entered, and if the standard deviation is outside the preset limit, the automatic set point generation 140 will ignore that datum and not determine a new set point since the standard deviation data is considered too variable to make an accurate set point adjustment. If the standard deviation is within the preset limit, the automatic set point generation 140 will then determine the difference between the actual position value and a manually entered target value, which is the desired actual position value. If the new calculated difference is determined, by automatic set point generation 140, to be within a prescribed range, no further action or calculation will be made. However, if the difference is outside the prescribed range, the automatic set point generation 140 will determine a new control set point. This new control set point is derived by adding to the current set point the difference between the target value and actual position value.

Referring now to FIG. 6, once every machine product repeat length, a difference block 142 determines the difference between the current control set point value from automatic set point generation 140 and the associated relative position value from relative position 138, which is the placement error. The difference block 142 transmits this placement error, in lineshaft encoder counts, to placement control 144. The placement control 144 compares the placement error to a tolerance band 170 (FIG. 8), which defines an acceptable deviation of the relative position value about the current control set point. The tolerance band 170 remains constant about the control set point, but the control set point can vary as calculated by automatic set point generation 140. As a result, while the position control of the reference marks occurs at the nip, the setpoint for this position control is accurately derived from the signals generated by sensor 108 and photoeye 110.

With reference to FIG. 8, there is illustrated one derived set point 168 having a prescribed tolerance band 170. For purposes of explanation, the control set point 168 has a value of 1,000 counts, and the tolerance band 170 represents a deviation of plus or minus 12 counts. Each of the datum points 172, 174, 176, 178, 180 and 182, represents one product's relative position value as calculated by relative position 138. Waveform 156 represents signals generated by proximity switch 62, and waveform 158 represents signals generated by sensor 106. If a placement error value remains within tolerance band 170, no placement command will be generated. However, if a placement error value is outside tolerance band 170, then placement control 144 will generate a placement command. The placement command is directly proportional to the size of the difference represented by the value from difference block 142 and calls for a

measured advance or retard in the position of layer 66. The generated placement command is then transmitted to the logic/control processor 150 of main drive control system 126. FIG. 8 illustrates an example of how placement control 144 (FIG. 6) compares each datum point 172-182 to a current control set point in order to generate a placement error. The placement error for each datum point is compared to tolerance band 170 to determine if a placement command should be generated. In the example, point 176 is the only datum point where the placement error falls outside the tolerance band 170, which causes a placement command to be generated, thereby causing a following datum point to fall within the tolerance band 170.

The logic/control processor 150 (FIGS. 6 and 7) searches for and receives new commands from main registration control system 124. Specifically, processor 150 searches for and receives gear ratio commands from gear ratio control 136, and placement commands from placement control 144. For each gear ratio value update command, processor 150 transmits a command in accordance with preprogrammed instructions to electronic gear box 152 to modify the value used in a gear ratio block 208 (FIG. 7). For each placement command received from placement control 144, processor 150 transmits a placement command in accordance with preprogrammed instructions to electronic gear box 152.

Referring to FIGS. 7 and 8, electronic gear box 152 is schematically illustrated as comprising a gear ratio block 208, a difference block 210, a speed regulator 212, and an incremental move block 214. The gear ratio block 208 receives a gear ratio value from logic/control processor 150 (FIG. 6), and receives a pulse train from the feed nip gearing encoder 130. Gear ratio block 208 scales the pulse train from gearing encoder 130 and applies the gear ratio value to it in order to generate a reference signal to difference block 210. Difference block 210 receives both the reference signal from gear ratio block 208, and also receives a feed back signal from motor encoder 146, which communicates the current speed of motor 148. The difference block 210 determines the difference between the signals and generates a command signal to a speed regulator 212, which generates a speed reference signal to motor controller 154. Thus, the electronic gear box 152 precisely links the speed of the poly nip drive motor 148 to the speed of the lineshaft 128 through an electronically changeable gear ratio. This effectively synchronizes the speed of the nip motor 148 to the lineshaft 128 and allows frequent changes to the gear ratio, and thus the speed of motor 148.

With reference to FIGS. 6-7, electronic gear box 152 also receives a placement value from logic/control processor 150, and this placement value is received by incremental move block 214. Incremental move block 214 performs a "one time" move to appropriately change the reference signal by a measured amount of poly nip motor encoder counts, thereby calculating an exact one time increase or decrease in the amount of the layer of material being supplied by the nip motor 148. This can be done by relating the number of encoder counts of the motor encoder 146 to an actual amount of the layer of material supplied at the nip 72 (FIG. 5). In response to the placement command, an incremental move signal is generated and temporarily added to difference block 210, which increments or decrements, the reference signal received from gear ratio block 208, thereby resulting in a momentary change in the speed command signal sent to the speed regulator 212. Motor controller 154 receives the speed command signal from electronic gear box 152 (FIG. 6) and varies the speed of motor 148, which is represented by the motor encoder pulse train, in response thereto.

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As described, the desired registration of graphic 38 (FIG. 1) or graphic 42 (FIG. 2) in respective training pants 10, 40 can be accomplished. By selectively controlling the distance between successive reference marks 74 (FIG. 5), each mark 74 can be desirably registered with an associated component, such as an absorbent pad 32. Controlling the distance between reference marks 74 to a selected distance, such as machine product repeat length, accommodates or corrects for variations or other types of anomalies that may be present in the apparatus or process. By adjusting the speed and/or tension of continuously moving second layer 66, it can be appropriately registered with continuously moving first layer 54, thereby ensuring proper registration of a desired component, such as a graphic 38, to another component, such as a front panel 12 (FIG. 1).

While this invention has been described as having a preferred embodiment, it will be understood that it is capable of further modifications. It is therefore intended to cover any variations, equivalents, uses, or adaptations of the invention following the general principles thereof, and including such departures from the present disclosure as come or may come within known or customary practice in the art to which this invention pertains and fall within the limits of the appended claims.

What is claimed is:

1. An apparatus for controllably registering a plurality of reference marks of a continuously moving first layer with a plurality of corresponding reference marks of a continuously moving second layer, comprising:

means for providing a continuously moving first layer including a plurality of reference marks selectively positioned thereon,

means for providing a continuously moving second layer including a plurality of corresponding reference marks selectively positioned thereon,

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means for sensing each of the reference marks of one of the continuously moving layers and means for generating a signal in response thereto,

means for measuring the distance between two reference mark signals,

means for adjusting the length of the continuously moving one layer in response to the measured distance,

means for superimposing the continuously moving layers together,

means for detecting a reference mark of the continuously moving one layer and its corresponding reference mark of the continuously moving other layer, and means for generating a signal in response thereto, and

means for adjusting the speed of the continuously moving one layer in response to a generated signal in accordance with preprogrammed instructions to controllably register a reference mark of the continuously moving one layer with its corresponding reference mark on the continuously moving other layer.

2. The apparatus of claim 1 wherein the reference marks of the one layer are spaced apart a selected distance, and wherein the reference marks of the second layer are spaced apart a different selected distance.

3. The apparatus of claim 2 wherein the reference marks of the one layer are spaced apart a distance less than a machine product repeat length.

4. The apparatus of claim 3 wherein the reference marks of the other layer are spaced apart a distance substantially the same as a machine product repeat length.

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